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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 26 FEBRUARY, 1943 NUMBER 2

RESTORATION OF THE LOWER CUL-DE-SAC*

A SIMPLE EFFECTIVE PROCEDURE WHEN SCAR TISSUE IS PRESENT IN THE ORBIT

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There are certain patients who are unable to wear a prosthesis because of scar tissue in the lower cul-de-sac, which usually is associated with ectropion. The conjunctiva of the lower cul-de-sac is often plentiful and only slightly scarred.

Because no mention of the operation to be described for the restoration of the lower cul-de-sac, which requires no graft, has been found in the literature, five cases are reported. The first operation was performed in 1916. The clinical findings in these cases were almost identical. The lower cul-de-sac was distended with fairly firm scar tissue, and the conjunctiva was drawn into folds over this tissue; the lower eyelid was partially or completely everted (fig. 1a).

The operation uses the principle of Snellen's[1] sutures for ectropion and resembles Wiener's[2] excellent technique of removing scar itssue and saving conjunctiva. However, Wiener uses a skin graft, and opens the conjunctiva by a horizontal incision in removing the scar tissue. He believes that it is important to have the sutures pulled through by tightening them daily, instead of cutting them. Daily tightening has not been found necessary in our cases.

PREOPERATIVE PREPARATION

An attempt should be made to cure conjunctivitis, if it is present, and to improve chronic meibomianitis. Chronic infections, especially staphylococcic infection, should be treated. A Wassermann test should be made, and coagulation and bleeding time studied.

INSTRUMENTS AND SUTURES

The instruments required are: an eyelid speculum; a medium-size scalpel; Stevens scissors; medium-size mouse-tooth forceps; six large curved cutting needles, threaded to double-arm no. 5 paraffinized black-silk sutures; large blunt slightly curved heavy scissors; needle holder and 0000 plain catgut on an atraumatic needle.

TECHNIQUE OF OPERATION

1. After the speculum is inserted, if this is possible, a vertical incision, 2 cm. in length, is made in the conjunctiva, close to the outer canthus (fig. 1b), in the lower two thirds of the cul-de-sac.

2. The conjunctiva is then undermined nasally over the lower half of the cul-de-sac. In all five cases it was necessary to excise most of the scar tissue.

3. An incision is made with a scalpel or heavy blunt scissors down to the anterior surface of the inferior orbital margin along its entire extent, keeping close to the tissues of the lower eyelid (fig. 1c).

4. Three double-armed sutures are passed through the conjunctiva at the lowest point of the cul-de-sac; the needles are brought out through the skin,

*Aided by a grant from The Ophthalmological Foundation, Inc.

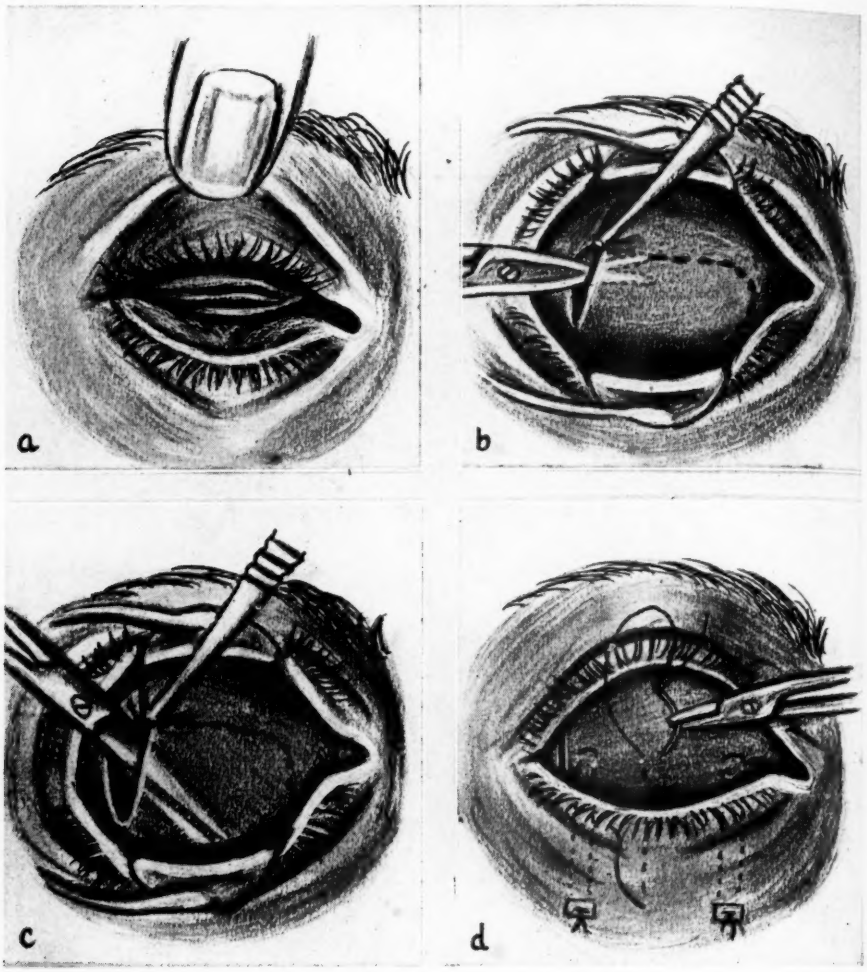

Fig. 1 (Berens). a, The lower cul-de-sac is distended by scar tissue covered by folds of conjunctiva. There is marked ectropion. b, A vertical incision, 2 cm. in length, is made in the conjunctiva, close to the lateral canthus. In the lower two thirds of the cul-de-sac the conjunctiva is undermined nasally. c, The subconjunctival scar tissue is excised and an incision is made to the lower orbital margin. d, Three double-armed sutures are passed through the conjunctiva at the lowest point of the cul-de-sac; the needles emerge through the skin passing through the tissue on the anterior surface of the inferior orbital margin, and the sutures are tied over rubber pegs.

passing through the tissue on the anterior surface of the inferior orbital margin, and tied over rubber pegs (figs. 1d and 2) or strips or buttons of plastic material.

5. After drawing the conjunctiva firmly down to the orbital margin, the vertical incision in the conjunctiva is closed with 0000 plain catgut.

6. It has been found unnecessary to insert Kerr's dental compound or any form of temporary prosthesis.

7. The conjunctiva is filled with 1:3,000 metaphen ointment, which is also placed around the rubber pegs. A gauze dressing is applied and held firmly with adhesive strips and a bandage.

Postoperative treatment

The dressing is removed after three days, and if there are signs of infection

the black-silk sutures are removed. Otherwise the sutures are allowed to remain for five days.

Case reports

Case 1. G. F., aged 30 years, had an inadequate lower cul-de-sac of the right eye, with ectropion. On December 12, 1916, the scar tissue in the contracted cul-de-sac was removed by subconjunctival extirpation and the conjunctiva sutured to the inferior orbital margin. On December 19th a satisfactory socket had been produced.

Case 2. J. T., aged 25 years, had an obliterated cul-de-sac of the right eye. Restoration of the cul-de-sac was undertaken on September 4, 1920, as follows: The conjunctiva was incised and the fibrous tissue underlying it removed. Three double-armed sutures were inserted. The resulting socket was good.

Case 3. E. R., aged 26 years, suffered the loss of his left eye in a gasoline-tank explosion in 1928. On June 10, 1932, the obliterated inferior cul-de-sac was restored by operation as herein described. The result of the operation was good.

Case 4. O. W., aged 44 years, had absolute glaucoma of the left eye. On April 27, 1934, this eye was enucleated and a gold ball implanted. Plastic restoration of the lower cul-de-sac of the eye was undertaken on July 18, 1934. A good socket was produced.

Case 5. N. P., aged 15 years, had a contracted, scarred inferior cul-de-sac with partial ectropion of the lower eyelid. On May 3, 1940, the lower cul-de-sac of the right eye was reconstructed, as follows: A vertical incision was made in the floor of the lower cul-de-sac near the outer canthus. The conjunctiva was undermined. Scar tissue was excised, 1.5 cm. in length and 0.5 cm. in breadth. A good socket resulted.

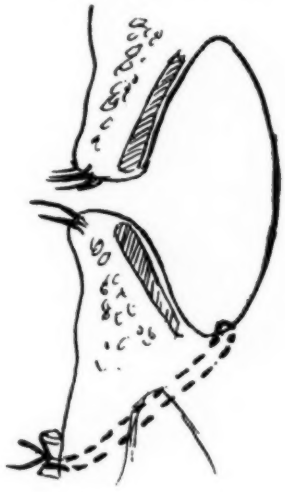

Fig. 2 (Berens). Cross section showing course of black-silk suture in the lower eyelid.

Summary and Conclusion

In five patients, whose inferior culs-de-sac were obliterated by scar tissue, resulting in ectropion, the orbital scar tissue was excised and the conjunctiva undermined over the lower half of the cul-de-sac. Incision was made to the lower margin of the orbit. Three double-armed sutures were passed through the conjunctiva and lower eyelid to attach the conjunctiva to the inferior orbital margin. A good inferior cul-de-sac was formed in each case and a prosthesis could be worn with satisfaction.

35 East Seventieth Street.

References

[1] Snellen, H. Modifications a l'operation de l'ectropion. II. Congress of Ophthalmology, Paris, 1862, p. 236.

[2] Wiener, M. Restoration of the conjunctival cul-de-sac for the insertion of an artificial eye. Jour. Amer. Med. Assoc., 1908, v. 51, p. 1070.

TERMINOLOGY IN OCULAR MOTILITY AND ALLIED SUBJECTS

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PERTINENT QUOTATIONS

"The purposes of natural science require that its nomenclature* shall be capable of exact definition, and that every descriptive technical term be rigorously limited to the expression of the precise quality or mode of action to the designation of which it is applied."—*Marsh, Lectures on Eng. Lang. VIII (Oxford Dictionary).*

INTRODUCTION OR PREFACE

Words are the medium by which we communicate our ideas; indeed, they are the tools of thought itself. Realizing that clear, precise, and accurate thinking, speaking, and writing require clearness, precision, and accuracy in the use of words, we have undertaken to clarify some of the ambiguity that prevails in the field of ocular motility and allied subjects. The first essential for any science is to agree on a terminology with exact definitions in order that we may speak the same language and write in exact terms concerning it. We realize that it is impossible to bring about unanimous agreement, that many writers and teachers will continue to use terms with their own private preferred meanings, regardless of what other writers have done and are doing. Many have given the matter no careful thought but have followed the usage of those with whom they have come in contact, even if their leadership was unreliable. But we are hopeful that many will welcome an attempt, especially if it is based on a study of the usage of the "best writers," the most worthy leaders (meaning those who show that they give careful thought to the terms they use, that they are well acquainted with the literature and therefore with the usage of previous writers, and who further show a clarity of expression in their writings which is the fruit of clear and precise thinking).

Of course we do not claim to speak with authority. Our decisions in dubious cases can carry weight only in so far as we present convincing reasons for our opinions. It is better to have uniformity and definiteness, even if there is not infallibility.

We invite constructive criticism and expression of opinion, especially if accompanied with reasons.

The reader will look in vain in this list for terms that are well established and about which there is no uncertainty, no ambiguous usage. These we take for granted. The terms we do include are grouped under the headings: points, lines, planes, fields, angles, units, movements, fusion, stereopsis, heterophoria, heterotropia, abbreviations, words misspelled, mispronounced, words in the choice of which good writers differ.

POINTS

Fixation point, nodal points, principal points, anterior and posterior foci, fovea

* It may be of interest to state what we conceive to be the difference between nomenclature and terminology. Nomenclature deals with the systematic naming of things—specifically, the names of things in any art or science. For example, the nomenclature of disease as in the "Standard classified nomenclature of disease."

Terminology covers the technical terms used in any art or science. In its restricted sense it applies to the terms employed to describe the characters of things as distinguished from their names.

—these are terms about which there is no uncertainty. There is a tendency to use macula when fovea is meant. The two are not synonymous. The center of the macular area is the fovea. The plural of fovea in English is foveas. It is no longer a foreign word but thoroughly adopted into the English language. Therefore, it should be governed by English usage, not Latin. There are many foreign words that have been adopted into the English language. There are some that are in process of adoption, in which case there is ground for difference of opinion. In employing such words as cornea, iris, retina, the adjective rectus, it is better English to say both retinas, rather than both retinae, and especially is it better English to say two rectus muscles, not two recti muscles.

The center of rotation of the eye is not a fixed point because the eyeball sways slightly when it rotates. The center of rotation is "an ever-changing one" (Duke-Elder). There are two conceptions:

(a) That of Joh. Müller: . . . the center of rotation is the center of curvature of the sclera (a point fixed with respect to the eyeball). It is usually assumed that the optic axis passes through it (Helmholtz, v. 3, pp. 119-120; Southall, pp. 170-172; Laurance, p. 28; Tscherning, p. 346).

(b) Volkmann's conception, which we favor. It is the practically useful, more fundamentally significant. The center of rotation is the point of intersection of the different positions of the line of sight when the eye is turned in different directions—a point fixed with reference to the head (Helmholtz and von Kries, v. 3, pp. 120, 127-136). It is not a point but a caustic. As pointed out by Glenn Fry* (whom we follow here as in several other items, and whose sound and helpful suggestions we gratefully acknowledge), it is not a question of which conception is right. Both are straightforward and usable. Volkmann's is the practically useful, more fundamentally significant.

In emmetropia it is 13.5 to 14 mm. behind the apex of the cornea and 10 to 10.5 mm. in front of the posterior surface of the sclera. It is about 1.3 mm. behind the midpoint of the optic axis, 1.65 mm. to the medial side of the visual axis.

Center of pupil, more definitely, center of pupil of entrance (Abbé); that is, pupil as seen through the cornea, slightly magnified and moved forward 0.5 mm. (apparent pupil).

Corresponding points: Points on the two retinas which have the same relative directional spatial value. For every point on the retina of one eye (except for the temporal crescent of each uniocular field which is not included in the binocular field of vision, and except for the blind spot), there is a point on the retina of the other eye, stimulation of which gives the same sensation of direction. The foveas are the corresponding points *par excellence.*

Formerly it was taught that points which had the same angular distance and direction from their respective foveas were corresponding points (Helmholtz). This is not true if attention is paid (as of course it should be) to retinal incongruities. The vertical and horizontal anatomic meridians of the retina are not (in most cases) the subjective vertical and horizontal; that is, the apparent vertical and horizontal. Usually lines that appear horizontal are tipped down at the temporal end by 0.5° to 1°, and lines which subjectively are vertical are in reality tilted outward about 2°. Another incongruity is the difference in space value of the nasal part of the retina, as compared

*Glenn Fry, Professor of Optometry, Ohio State University.

with the temporal, which causes the Kundt illusion and the Münsterberg illusion and causes the horopter to depart from the Vieth-Müller circle (=Hering-Hillebrand horopter deviation).

The importance of the conception of corresponding points is very great in the study of space sense and in the study of binocular vision and ocular motility. It is the basis of the fusion of two monocular images into one binocular image by the motor activity (fusional movement) which moves the eyes so that the two images fall on corresponding points. If the two images fall on noncorresponding points, called *disparate* points, they are seen as two separate objects—double images—unless the disparity is small or capable of interpretation by the space sense so that they are fused with depth effect.

Retinal correspondence is not an anatomic peculiarity innate and unchangeable. In squint, *anomalous correspondence* frequently develops. In this condition a different point of the retina of the squinting eye acquires a more or less perfect correspondence with a point of the nonsquinting eye. This is *secondary correspondence,* or anomalous correspondence. Another definition: If elements of the two retinas—for example, the fovea of one and an excentric element of the other retina—acquire a common visual direction, this new sensorial relationship is termed anomalous or secondary.

In connection with secondary correspondence, there is a tendency on the part of some to refer to that part of the retina which now corresponds (secondarily or anomalously) with the fovea of the other eye, has the same directional value, as the *false macula* or *false fovea.* This we regard as bad usage and recommend its abandonment.

Horopter is the sum of those points in space, the images of which, for a given position of the eyes, fall on corresponding points (areas). All other points in the field of view are really seen double = *physiologic diplopia,* called by Chavasse introspective diplopia.

Lines

Optic axis. The optic axis of a dioptric system—for example, a telescope or microscope—is the line passing through the centers of curvature of the refracting surfaces. On it lie the foci and the nodal and principal points. Since the dioptric system of the human eye is composed of refracting surfaces that are not spherical and therefore have no exactly determinable centers of curvature, and since even if this is granted but one takes the nearest approximation to a true spherical surface for each of the refracting surfaces, particularly the anterior surface of the cornea and the anterior and posterior surfaces of the crystalline lens, it is found that there is such tilting and decentering of the surfaces that no axis of symmetry is possible, since there is no line on which lie all the approximate centers of curvature, and since, further, there is no easy way to find such an axis in a given eye, it must be conceded that the optic axis is an imaginary, nonexistent, fictitious thing.

However, for practical mathematical and geometrical and even clinical purposes, the conception of an optic axis is indispensable, for example in the schematic eye, and therefore the best thing to do is to adopt a substitute that approximates closely enough for practical purposes what would be the true optic axis if one made over an eye so that the surfaces were spherical and so that the centers of curvature of the surfaces were all on a straight line. This working substitute for an optic axis, agreed on by Gullstrand (Helmholtz, Physiological optics. Amer.

ed., v. 1, pp. 94 and 315) and other lesser lights, is the line perpendicular to the surface of the cornea; that is, the normal to the cornea, passing through the center of the pupil of entrance. One advantage of this arbitrary optic axis is that it is easy to determine (Tscherning, pp. 36-37; Duke-Elder, v. 1, p. 758).

Pupillary axis (pupillary line; optic axis of Gullstrand) is the line perpendicular to the cornea through the center of the pupil of entrance. Since it is perpendicular to the cornea, it passes through the center of curvature of the cornea, therefore it coincides with the optic axis, assuming that the eye is a well-centered optical system with the centers of curvature of all its refracting surfaces on a straight line.

Visual line (syn. visual axis, line of vision, line of regard, line of gaze, Gesichtslinie) is the line from the point of fixation to the anterior nodal point and from the posterior nodal point to the fovea; or the broken line from the point of fixation to the fovea passing through the nodal points.

Line of direction (Richtungslinie) is a line from a point in space to the anterior nodal point and from the posterior nodal point to the retina. This is the path of a ray of light from the point to the retina, and such a ray is called a *direction ray* (Helmholtz, v. 1, pp. 96-97). The principal line of direction is from the fixation point to the fovea by way of the nodal points; it is called the visual line. All lines of visual direction meet at the anterior nodal point. All except the principal line of direction are secondary lines of direction (Helmholtz, Physiological optics. Amer. ed., v. 1, p. 97). They are all axes of pencils of light.

Sighting line (syn. line of sight, Visierlinie) is the line from the point of fixation to the center of the apparent pupil. It also passes through the center of rotation. In aligning two points at different distances, the sharp image of one (the one in focus) is made to fall in the center of the blurred image (blur circle) of the other. A line passing through two such apparently coincident points is called a line of sight.

Fixation line (syn. Blicklinie, line of sight) is the line from the fixation point to the center of rotation of the eyeball. To remember this, think of the act of fixation, which calls for rotation of the eye—this takes place around the center of rotation. Since the center of rotation is the intersection of the different positions of the line of sight, the fixation line is identical with the line of sight.

Planes

These offer little opportunity for confusion or erroneous use.

Fields

Field of vision (visual field, Gesichtsfeld) is concerned with the passive eye. The area in which objects are visible during fixation; that is, while the eye is stationary—the locus of all the points visible from one position of the eye; all the points that can be seen without moving the fixation.

Field of fixation (Blickfeld) is concerned with the mobile eye. It comprises all the points that can be fixated by moving the eye but without moving the head. The widest limits to which the fixation lines can be moved in different directions without moving the head.

Angles

Visual angle—the angle at the first nodal point subtended by an object. The angle at the anterior nodal point between two lines of direction, one from each extremity of the object.

Angle alpha—angle formed by the optic

axis and the visual line at the nodal point.

Angle gamma—angle between the optic axis and the fixation line at the center of rotation.

Angle kappa (Landolt, 1878) is the angle between the pupillary axis which is normal to the cornea, which passes through the center of the pupil (the line chosen by Gullstrand and others as the best optic axis), and the visual line. In practice it is the angle kappa that is readily measured, that expresses the obliquity of the dioptric system which makes for an apparent strabismus, and which must be allowed for in accurate measurements of the deviation in strabismus. As in the case of angle alpha and angle gamma, the lines chosen for the sides of the angle do not always meet, and in such cases there is no true angle.

Angle lambda (Glen Fry) is the angle at the center of the pupil of entrance between the pupillary axis and the line of sight.

Angle of deviation (angle of squint). Normally the visual axes of both eyes pass through the fixation point (by definition); that is, the image of the point of fixation falls on the fovea of each eye. If the visual axis of one eye does not pass through the fixation point, that eye is said to "deviate." The image of the point falls on some peripheral part of the retina where the line of direction of the point meets the retina.

The angle of deviation is the angle between the line of direction of the point and the visual axis. Practically it is equal to the angle through which the eye must move to bring the image on to the fovea. The effect of deviation in normal eyes is diplopia. The image of the point of fixation falls on the fovea of one eye; to be seen single it must fall on the corresponding point of the other eye, which is its fovea, or else it must be suppressed, or else there must be anomalous secondary correspondence.

Angle of anomaly (Bielschowsky), angle of adaptation (Chavasse). When an eye has deviated a long time, a certain amount of adaptation may take place. The fovea of one eye no longer has the same directional value as the fovea of the other eye, but instead some peripheral point of the retina of the deviating eye acquires a directional value corresponding to the fovea of the fixating eye. This is secondary or anomalous correspondence. The angle between the line of direction of the fovea and the line of direction of this new point which corresponds in directional value with the fovea of the other eye, is the angle of adaptation or the angle of anomaly.

Harmonious correspondence. If the angle of anomaly or of adaptation is equal to the angle of deviation, the secondary correspondence (anomalous correspondence) is called "harmonious." The point of the retina of the deviating eye on which the image of the point of fixation falls is the point that has acquired correspondence with the fovea of the fixating eye. Sometimes (often) it is not this point but some point between it and the fovea that corresponds with the fovea of the fixating eye. Then the correspondence is subharmonious (Chavasse).

Residual angle of strabismus is the angle of deviation left after an operation to correct the strabismus.

Movements

Movements are: A. monocular, and B. binocular.

A. Monocular movements are *ductions*, namely:

Adduction is rotation toward the midline = nasally

Abduction is rotation away from the midline = temporally

Sursumduction is rotation upward, also called *Elevation*

Deorsumduction is rotation downward, also called *Depression*

Cycloduction is wheel-rotation about the sagittal axis, also called *Torsion*

Dextrocycloduction—top of the vertical meridian to the right, also called *Dextrotorsion,* or for the right eye extorsion, and for the left eye intorsion

Levocycloduction—top of the vertical meridian to the left, also called *Levotorsion,* or for the left eye extorsion; for the right eye intorsion

Intorsion is also called adtorsion

Extorsion is also called abtorsion

Torsion is called positive when the eye turns the same way as the hands of a watch at which it is looking.

There is a *torsion* produced by rotation of an eye from the primary position about an oblique axis to a tertiary position, which tilts the vertical meridian (namely, when looking up to the right, both vertical meridians rotate to the right; when looking down to the right, both vertical meridians rotate to the left). Duke-Elder recommends that the term torsion be reserved for this form of tilting.

The word cyclo- lends itself well to all forms of wheel rotation (*cyclus* circle) as *cycloduction, cyclovergence, cycloversion.* We suggest *cycloduction* as a better term than torsion because in line with the other ductions and because *torsion* may well be reserved:

(a) As suggested by Duke-Elder, for the effect of rotating an eye around an oblique axis; that is, up and out, up and in, or down and out or down and in from the primary position. This is always accompanied by a tilting of the vertical and horizontal meridians called torsion, also false torsion.

(b) And for the effect produced by oblique cylinders and oblique meridional size lenses, in which case there is no wheel rotation of the eyeball but a displacement or distortion of the dioptric images. In cycloductions the retinal mosaic (as part of the eyeball) is rotated. In the torsions (if we use the word as here suggested) the retina is not rotated but the dioptric image is.

Protrusion—movement of eyeball forward, result exophthalmos.

Retraction—movement of eyeball backward, result enophthalmos.

B. Binocular movements are of two different types:

I. *Conjugate* (jugum a yoke)—both eyes move in the same direction = parallel movements

II. *Disjunctive,* disjugate (Chavasse)—the eyes move in opposite directions.

I. Conjugate movements are grouped as *Versions*

Dextroversion—conjugate to the right

Levoversion—conjugate to the left

Supraversion—conjugate upward, also called *Elevation*

Infraversion—conjugate downward, also called *Depression*

Cycloversion—both eyes rotate in the same direction about their sagittal axes = conjugate torsional rotation, conjugate wheel-rotation

Dextrocycloversion—both eyes make wheel-rotation to the the right; that is, top of vertical meridian to the right = positive

Levocycloversion—both eyes make wheel-rotation to the left = negative

Cycloversions are especial manifestations of labyrinthine and proprioceptive control; for example, in tilting the head toward the right shoulder, a reflex levocycloversion occurs.

II. Disjunctive binocular movements, one eye to the right, the other to the left; one eye up, the other down, are grouped as *Vergences.* These are the typical movements of adjustments for fusion, and the adjustments for distance.

Convergence (syn. bilateral adduction, Verrijp)—each eye rotates toward the nose; that is, each eye is adducted. Then why not call this adduction? Because adduction is reserved for monocular rotations and to use the same word for both leads to confusion. Moreover, there can be no uncertainty about convergence, it demands two axes making an angle. One line cannot make an angle, one eye cannot converge.* If there were another good word for monocular adduction, adduction could be released for use for the binocular function of convergence. Convergence is so deeply rooted that it cannot be lightly brushed aside. No one wants to give up the use of convergence in *many* cases. Why not use it in *all* cases where that kind of movement is meant, and reserve adduction for monocular rotations for which it is indispensable?

Divergence. Analogous reasons make divergence the correct term for simultaneous abduction of both eyes, a binocular disjunctive movement. When the visual axes are made to converge, we call it convergence; when they are made to diverge, we call that divergence. No one can possibly be confused as to our meaning.

Disjunctive vertical movements are called by Bielschowky *Vertical divergence*—positive when the right eye goes up and the left down, negative vertical divergence when the right eye goes down, the left up. Older terms are: *Sursumvergence* right or left, according to which eye goes up; *Deorsumvergence* right or left, according to which eye goes down. These terms have not achieved popularity but are good usage.

Disjunctive wheel rotations are called by many names: cyclovergence positive = conclination, intorsion or adtorsion of both eyes, cyclovergence negative = disclination, extorsion of both eyes. In the interest of uniformity and consistency, *cyclovergence* fits with convergence and divergence and vertical divergence, and seems preferable to conclination and much to be preferred to intorsion and extorsion or adtorsion and abtorsion which, if used at all, might be used for monocular movements.

Phorias

Alternating hyperphoria. There is no source of confusion in the terms used to define different types of heterophoria except in the case of the special type of hyperphoria in which the covered or excluded eye turns up, whether right or left, always the covered eye. It is variously called: double hyperphoria, alternating hyperphoria, dissociated hyper-

* If a person who has had one eye enucleated is asked to look at an object which is moved toward him in the midline, his seeing eye keeps fixation on it and the movement is governed by the convergence reflex, better called the near reflex, and is associated with contraction of the pupil and with accommodation, as in a binocular person. In this sense a one-eyed person can converge toward the theoretic visual line of the other eye. The innervation is different when the object fixated, instead of being brought nearer to the face, is moved sidewise at a fixed distance from the face in such a direction as to cause adduction. In both cases the movement is the same, but in one it is controlled by the mechanism for convergence, and in the other by the mechanism for adduction (latero-duction or latero-version). This is additional reason for using terms with exact meaning.

phoria, alterocular hyperphoria, dissociated vertical divergence.

This is definitely not a form of heterophoria in the accepted sense. Heterophoria is a disturbance of associated ocular movement.* For example, in a case of exophoria, if the right eye is covered, it diverges a certain amount, say 6Δ. If the left eye is covered, it, in turn, diverges very nearly the same amount, 6Δ. Special circumstances [of which the chief are: (1) a difference in refraction which calls for a difference of accommodation, according to which eye is fixating, and (2) a recent paresis] cause differences, but in general it is true that the deviation of one eye is the same as of the other. In a case of hyperphoria, if the right eye deviates up under cover 2Δ (2Δ of right hyperphoria), the left eye when covered and the right eye is fixating will deviate downward 2Δ almost exactly. Thus, in general, heterophoria is an affair of associated ocular movement so closely associated that either eye will deviate approximately the same amount and the corresponding direction.

In the form of vertical motor anomaly under consideration the disturbance is not of associated but of dissociated ocular movement. When the right eye is covered it deviates up, when the left is covered it deviates up instead of down, as in a true hyperphoria. There are various other features which complete the picture as given by Cords (in Schieck and Brückner's Kurzes Handbuch der Augenheilkunde, v. 3, p. 562) and Bielschowsky (Pflüger's Arch., v. 136, p. 658).

Dissociated vertical divergence is the most fitting term to use and should displace alternating hyperphoria.

Definition of heterophoria. The term was invented by Stevens, whose conception was that heterophoria is a tendency (φορα) of the eyes to deviate. As time has gone on, the leading contributors to our understanding of the nature of heterophoria have almost unanimously taken the view that heterophoria is an *actual* deviation which is overcome and rendered latent when fusion is permitted. Von Graefe called it latent strabismus, which is precisely what is meant by the various definitions proposed by the masters of the past 40 years; Duane and Fuchs; the Graefe Saemisch Handbuch = Bielschowsky; the Kurzes Handbuch = Cords; Verrijp in Berens's textbook. Only the more superficial thinkers adhere to the idea of a "tendency to deviate."

What shall one call the position assumed when fusion is prevented and the eyes deviate? Here there is considerable confusion. There is a widespread custom of calling it the "position of rest." Formerly it was the conception that this was a position assumed when the eyes were at rest, passive, relaxed, not innervated. For a long time it has been realized that the eye muscles are not at rest, not free from innervation. One eye is fixating, the other is covered, or otherwise excluded from binocular vision, but the innervation required for the fixation of the fixating eye goes to the muscles of both eyes—the two eyes form a binoculus, a single organ in two parts, innervation always goes to both eyes. The question one asks is: When one eye fixates, what does the innervation necessary for this act do to the other eye? In the ideal condition it makes the covered eye rotate so that it too fixates the same point, and when the cover is removed, no movement of redress is needed because the image of the point being fixated by the first eye now falls on the fovea of the second eye —there was no deviation.

The objection to speaking of the position of the covered eye as a position of

* The eyes are dissociated to reveal a phoria. By associated ocular movement, I refer to the innervation according to Hering's law, by which the innervation is equal to both eyes.

rest is that it leads the beginner to assume that it *is* at rest, leads him to turn his thought away from the important essential fact that the muscles of that eye also are being innervated—but not perfectly. As soon as fusion is permitted, a further innervation takes place which corrects any deviation that existed. To avoid this false implication, the term was modified to "relative position of rest," "position of comparative rest" (Chavasse). But still the emphasis is on the idea of rest, repose, freedom from innervation. The fusion-free position may be one of convergence, but under ether the position of rest may be one of divergence.

The term "fusion-free position" proposed by Hofmann correctly describes the state of affairs. The portion of innervation that is removed is the fusion innervation. The innervation for fixation of the fixating eye is in full operation and acts on both eyes. Also any other innervation, such as tonus, continues to act on both eyes. The only innervation that is removed is the fusional innervation, hence the term "fusion-free" is a good one—better than Chavasse's suggestion "fusion-frustrated."

Convergence is measured:

(a) As *Prism-convergence,* which is measured while the patient is fixating a distant object. There are two end-points: first, when the distant object (which for this test must have suitable form; for example, letters near the limit of visibility, say 6/6) becomes blurred—this occurs when accommodation starts to act, stimulated by the act of convergence; second, when the test object actually ceases to be seen single and becomes double. The first is the *"blur-point,"* the second is the *"break-point."*

Third, the recovery point is determined. The rotary prism is still further rotated to separate fully the double images, and the patient, after closing his eyes for a few seconds, is asked if he sees two and is urged to tell at once when they become one again, as the rotary prism is reduced. The point of fusion is the *"recovery point."*

(b) Prism convergence is also measured at the reading distance. This is sometimes recorded as the "positive fusional reserve" (p.f.r.), and break and recovery are recorded.

(c) The near point of convergence is measured by having the patient fixate a suitable small object that is made to approach his eyes in the midplane, and the instant is noted when one eye deviates or when he sees the test object double. The distance of the test object is measured by a scale held in place for the purpose. The line connecting the two centers of rotation of the eyes is the base line from which to measure. It is about 25 mm. behind the point where spectacle lenses are mounted.

All measurements unless otherwise specified, are taken with the patient wearing his correction. Another good way to measure convergence amplitude is on a major amblyoscope.

Divergence is measured:

(a) For distance by prism, base in—that is, prism divergence—recording break and recovery.

(b) At the near point (40 cm. or other specified distance) by prisms, base in, and called "prism divergence at near" or at 40 cm. or other specified distance, or recorded by some as "negative fusional reserve (n.f.r.)."

Heterotropia

Heterotropia, strabismus, squint—all these terms are well established. It would be arbitrary to try to enforce a uniform usage.

In classifying heterotropia there are some suggestions:

When heterotropia is always present it is sometimes called "permanent" strabismus. This conveys the implication that it cannot be cured and is very objectionable as misleading the patient. A better term is *"constant"* strabismus. "Continuous" has been suggested.

When it is not always present, but only at times, it is often called "periodic" strabismus. The term periodic implies a "definite period, cycle, or round of time, an habitual tendency or disposition to recur at stated intervals of time as: the periodic character of ague, the periodic motion of a vibrating tuning-fork" (Century Dict.). A better adjective is *intermittent* (or occasional, Chavasse).

The rare cases of squint that manifest a periodicity, recurring say every other day, or at other regular intervals, are best referred to as *"cyclic."*

Monocular strabismus. Objection has been made to this term because strabismus is essentially binocular.

Unilateral strabismus is open to the same criticism. In our opinion either term is allowable and not likely to be misunderstood. We give the preference to *Unilateral.*

Esodeviations = esophoria and esotropia

Exodeviations = exophoria and exotropia

Lateriphoria and *horizontal phoria* cover both esophoria and exophoria; *lateriphoria* is very objectionable linguistically

Vertical deviations cover hyperphoria and hypertropia

Cyclodeviations cover cyclophoria and cyclotropia

Screen test for heterophoria and heterotropia

This is another name for the well-established term *cover test.* Are there any good reasons for preferring one or the other?

The cover test, as its name implies, is made by covering one eye. Duane fathered it, and stated clearly the different ways of using it.

The term *screen test* suggests at once the use of a screen. In this case of course the cover is the screen. To one hearing the term for the first time, but familiar with ophthalmology, the term screen would suggest a tangent screen such as the tangent screen used by Bielschowsky in his prism-red-glass-tangent screen test or the Maddox tangent cross with angles or prism diopters marked on it; or the tangent screen used by Lancaster in his red-green test. Many others have used a tangent screen for various purposes, not forgetting perimetry. The term screen suggests also the "silver screen" for projection lanterns. All these considerations would not suffice to condemn the use of the term screen test for the cover test if it were not for the fact that cover test is older, more definite, and perfectly satisfactory, therefore better than screen test.

One of the few words frequently misspelled is *amblyopia ex anopsia.* This is not two words, amblyopia exanopsia, but three. It would be just as sensible to write blind fromglaucoma as two words instead of three. Ex means from, that is, because of; anopsia means not using the eye. There is no possible excuse for exanopsia.

Fusion

Fusion may be divided into motor and sensory.

By motor fusion is meant those ocular movements necessary to bring the images of an object in space on to corresponding areas of the two retinas. It is a reflex requiring stimuli from both retinas (whereas the fixation reflex is monocular).

By sensory fusion is meant the complicated process by which the two uniocular sensations are combined into a single binocular perception by a synthesis we need not attempt to explain.

Pronunciation

Esophoria, if pronounced like other words of similar derivation, should have the initial e short, as in esoteric. It is from the short e (epsilon) in the Greek.* The chief excuse for making the initial e long, as in equal, is to distinguish sharply and unmistakably from exophoria. Thus it serves a useful purpose and its use has become widespread. We believe it would be futile to try to turn the tide and so reluctantly) vote for ēēsophoria, abbreviated as E.

Paresis is frequently pronounced with the accent over the second syllable. All dictionaries say par′esis, not pare′sis.

Abbreviations

C.C. or c.c.	with correction for refractive errors
S.C. or s.c.	without correction for refractive errors
p.p.	punctum proximum
$p.p._a$	punctum proximum of accommodation
$p.p._e$	punctum proximum of convergence
p.c.b.	punctum proximum from base line (intercentral)
E	Esophoria
E′	Esophoria for near
X	Exophoria
X′	Exophoria for near
R.H. or $\frac{R}{L}$	Right hyperphoria
L.H. or $\frac{L}{R}$	Left hyperphoria
T.	Tropia, that is, heterotropia added to E, X, etc., as exponent
$E.^T$	Esotropia X^T Exotropia $R.H.^T$ Right hypertropia, etc.
V.D.	Vertical deviation
pr. con. or Con.	Prism convergence
pr. div. or Div.	Prism divergence
p.f.r.	positive fusional reserve (Skeffington) = pr. con. at near
n.f.r.	negative fusional reserve = pr. div. at near (40 cm.)
R.C.C.S.	right convergent concomitant strabismus
L.C.C.S.	left convergent concomitant strabismus
R.D.C.C.	right divergent concomitant strabismus
L.D.C.C.	left divergent concomitant strabismus
A.C.C.S.	alternating convergent concomitant strabismus
B.V.	binocular vision
Dip.	diplopia
Anom.	anomalous correspondence
S.P.	simultaneous perception
S.M.P.	simultaneous macular perception (patient has S.M.P.) (target for testing S.M.P.)
1st deg. fus.	First degree fusion — the different degrees of binocular vision
2d deg. fus.	Second degree fusion — the different degrees of binocular vision
3d deg. fus.	Third degree fusion = stereopsis — the different degrees of binocular vision

These are a few of the abbreviations in common use. Of course there are many others, most of which might be called "private" abbreviations.

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* There are other words from the Greek via the Latin in which epsilon has become a long e which makes it less objectionable to say ēēsophoria.

This paper was prepared at the request of the National Committee on Optics and Visual Physiology. It was not found feasible for the Committee to act on each item, and so it was voted to have it published as it stands. Besides members of the Committee, others interested in terminology were consulted. Particular mention should be made of Dr. William H. Crisp of Denver, Dr. Harry K. Messenger of Boston, Prof. Glen Fry of Ohio State University, and my colleagues, Dr. Burian and Dr. Linksz of the Dartmouth Eye Institute.

This paper will fail of its object if it does not provoke criticisms and discussions, after which the Committee on Optics and Visual Physiology can issue a revision.

CHORIORETINITIS ASSOCIATED WITH POSITIVE SEROLOGIC TESTS FOR TOXOPLASMA IN OLDER CHILDREN AND ADULTS*

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Toxoplasma, according to Sabin and Olitsky,[1] is a genus of protozoan parasites which were first observed in the gondi, a North African rodent, by Nicolle and Manceaux in 1908, and in the rabbit by Splendore in the same year. They are highly organized parasites consisting of distinct cytoplasm and nuclear chromatin, are crescentic, pyriform, oval, or round, and measure 6 to 7 microns in length and 2 to 4 microns in width, depending on the stage of development. They multiply and produce disease in a large number of hosts such as gondi, rabbit, guinea pig, mouse, rat, squirrel, dog, monkey, pigeon, and other birds.

Wolf, Cowen, and Paige,[2] in 1939, found definite evidence of Toxoplasma in the granulomatous lesions in an infant, 31 days old, dead of "congenital encephalitis." In their excellent and very complete description of this case, they mention a Horner's syndrome of the left side, with deviation of the eyes to the right and intermittent nystagmus to the right. The fundi revealed an irregular, reddish-brown area in each macular region, about one disc diameter in size in the right eye and somewhat smaller in the left. These were interpreted as resulting from hemorrhage. Histologic examination of the retina showed edema of all its layers and distortion of the stratum opticum, ganglionic, and inner molecular layers. The capillaries of this zone had undergone endothelial hyperplasia. Many nerve cells in the ganglionic layers were partially degenerated. The layer of rods and cones was markedly necrotic. The pigmented layer was partially disrupted, and the destruction of its cells gave rise to much extracellular pigment. The choroid was congested, showed capillary hyperplasia, and was infiltrated by plasma cells, lymphocytes, and eosinophils. The leptomeningeal sheath of the optic nerve showed a similar mild infiltration. Parasites were found free in the tissue and within the cytoplasm of cells. Wolf and Cowen,[3] in 1937, reported a case in an infant, 30 days old, dead of "parasitic encephalomyelitis." The causative agent was identified on morphologic grounds as an Encephalitozoon, although Toxoplasma was considered. Examination of the fundi in this case revealed bilateral yellowish-white focal areas of chorioretinitis. Janku[4] reported the presence of parasitic cysts in the retinal lesion of the right eye of an infant who had microphthalmos of the left eye and increasing hydrocephalus from birth, but referred to them as Sporozoa, although Levaditi[5] suggested that they could be Toxoplasma. Examination of the fundi showed bilateral yellowish-white focal areas of chorioretinitis bordered by pigment in the macular region. The infant died at the age of 11 to 16 months; the exact age at death was not known. Janku, in reporting the histologic examination of the right eye in his case, states, "there is a chronic inflammation of the choroid with infiltra-

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tion of small round cells in the choriocapillaris. There are many obliterated vessels. There is dislocation of the nuclei of the external and internal nuclear layer. The lamina vitrea has been destroyed. There is an extensive proliferation of the pigment epithelium, but none in the central macular defect. There is an increase in the number of cells in the neuroepithelium with many degenerating and cystic changes. In the temporal half of the retina of the left eye is a tumorlike lesion reaching from the macula to the ciliary body. There is much glial proliferation, arising from the external nuclear layer. Many rosettes are seen. The macula has been destroyed and replaced by glial tissue. The retina has been infiltrated by many round cells. In the choroid there are extremely large cells measuring 10 to 15 microns with foamy protoplasm which I believe to be parasites. They are probably coccidium." Torres,[6] in 1927, and Richter,[7] in 1936, reported cases occurring in infants resembling Toxoplasma. In Torres's case, the infant died within two days, and no lesions were described in the fundi. In Richter's case, the infant died in the seventh week of life, and, in this case also, no retinal lesions were described. In a recent article, Sabin[8] has described 151 individuals suspected of Toxoplasma infection, 59 of whom gave positive neutralization tests for Toxoplasma. It is significant that in 9 out of 10 cases in which the sera contained neutralizing bodies for Toxoplasma, the only clinical manifestation was that of a chorioretinitis of unknown etiology with a predilection for the macular region.

Gross pathology

The parasites can be found in the central nervous system, myocardium, liver, spleen, skin, lymph nodes, bone-marrow, the adrenals, kidney, and other organs. However, the central nervous system is the site of the most severe and widespread changes. Wolf, Cowen, and Paige state that "macroscopically depressed, softened, yellowish focal lesions varying in size from a few millimeters to three centimeters in diameter are seen on the surface of the cerebrum. In these areas the convolutional markings are obliterated and the overlying leptomeninges are thickened and rendered opaque by a yellowish-gray exudate. There may be swelling of the gyri, and their overlying leptomeninges appear normal except for a varying amount of congestion. The spinal cord may show similar changes. The cerebral lesions may involve the subcortical white matter, the centrum ovale, and the wall of the lateral ventricle. They are yellow, soft, and cheesy, and gritty material may be palpable. Others may contain cysts measuring several centimeters in diameter.

Symptomatology

The symptoms previously described have been those of encephalitis, but may be extremely atypical. They usually consist of frontal headache, which may be very severe, low-grade chronic fever, cough, diarrhea, weakness, especially of the lower limbs, generalized lymphadenopathy, splenomegaly, secondary anemia, apathy or convulsions, and coma, and terminate in death. Sabin has described a clinical tetrad of symptoms in congenital toxoplasmosis: (1) Hydrocephalus or microcephalus, (2) cerebral calcification, (3) chorioretinitis, and (4) disturbances of nervous function.

There is a leucocytosis with predominance of the polymorphonuclear leucocytes. The spinal fluid may show an increase in cells, mostly lympocytes. X-ray

studies of the skull may show cerebral calcification, observed as small white areas throughout the brain substance, or even a thickening of the inner plate of the skull itself. However, the symptoms are protean and may not be limited to the central nervous system.

The parasite can multiply only in living cells, and Sabin has demonstrated that they may be transferred experimentally to other animals by intracutaneous, subcutaneous, intravenous, intracerebral, intranasal, and oral routes. Contact infection can occur if the animal is fed on other animals recently dead of the experimental disease. It is probable that this infection is transmitted to man through the lower animals, but of the means we, as yet, know very little.

The diagnosis is made in the laboratory. The spinal fluid or heparinized blood or both are injected into mice and guinea pigs by the intracerebral and abdominal routes. Using rabbits, neutralization tests can also be made with human sera. For details of these tests, reference should be made to Sabin's article.

With the exception of the report by Wolf, Cowen, and Paige, and Janku's reference to retinal cysts, there has been no adequate description of Toxoplasma infection of the eye. Several cases of probable toxoplasmic chorioretinitis were seen at the eye clinics of the General Hospital, and of the Children's Hospital, Cincinnati, Ohio.

Case reports

Case 1. N. H., a white girl, aged seven years, first entered the eye clinic on September 28, 1934, complaining of poor vision. Early childhood was spent on a farm and was uneventful, the only diseases contracted being measles in 1934, and subsequently chickenpox, in 1935. The patient had a pet dog and cat during this time. When she was six years of age, the parents moved to Hartwell near Cincinnati, and while there, the patient also had a cat for a pet part of the time. The parents were first apprised of the eye condition by the school nurse, who told them that the child had bad eyes.

The maternal and paternal grandparents had normal eyes. The father, J. H., aged 53 years, has normal eyes. The mother, E. H., aged 44 years, has normal eyes but positive neutralization bodies for Toxoplasma. One brother, aged 22 years, is now in the Army and could not be examined. Another brother, aged 19 years, and a sister, aged 18 years, have normal eyes, and their Toxoplasma tests were negative.

Examination of the patient's eyegrounds, in 1934, revealed a secondary bilateral optic atrophy and bilateral central chorioretinitis. The condition was considered congenital. Vision in each eye was 20/200 and could not be improved. The patient was referred to sight-saving classes. On January 18, 1938, a complete physical examination was made, the only positive findings being those referable to the eyes, and the ocular findings were those previously observed. The urine was negative as to both microscopic and chemical examination. The Wassermann and Kahn tests were negative. The intracutaneous test for tuberculosis was negative to first- and second-strength tuberculin. A note made on April 14, 1938, states, "The lids, conjunctiva, and cornea show no pathologic changes. The pupils are widely dilated but react to light and accommodation. There is a horizontal nystagmus. The discs are white and there is a marked deposit of pigment about the edges. A large white area about the size of the disc covers each macula."

The Kahn and Wassermann blood tests were repeated and found to be negative.

The spinal fluid was clear, the pressure normal and negative to Wassermann, Kahn, and Pandy tests. There were no cells, and the protein content was 20 mg. percent.

On January 13, 1939, the fundus examination disclosed a disseminated chorioretinitis throughout the left eye. On February 4, 1941, the patient returned to the eye clinic, complaining of pain, photophobia, and redness in the left eye. Examination disclosed an acute anterior and posterior uveitis, Descemet's membrane being plastered with large mutton-fat deposits. There were many vitreous opacities, and the patient was admitted to the Hospital for treatment.

Therapy consisted of the instillation of 1 drop of 1-percent atropine sulphate in the left eye, three times daily, continuous heat in the form of altherms, 30 million typhoid in the form of antigen H, and repeated three days later, the antigen-H dose being increased to 60 million, together with the administration of 15 gr. of sulfathiazole given every four hours for 37 doses. The uveitis disappeared, and the patient was discharged on March 4, 1941.

Full-mouth X-ray studies, taken during the hospital confinement revealed no foci of infection. The otorhinolaryngologic consultation revealed buried tonsils containing many large crypts from which much caseous and liquid debris could be expressed. There were also a number of small masses of injected lymphoid tissue on the posterior pharyngeal wall. X-ray films of the sinuses revealed a low-grade bilateral ethmoiditis.

On April 7, 1941, a course of gold therapy was started in the hope of influencing the chorioretinitis more favorably; 495 mg. of solganol were given in small doses over a period extending from April 7, to June 6, 1941, but with no demonstrable benefit. It is interesting to note that vision throughout the entire period in which the patient was observed remained 20/200 in each eye.

On July 11, 1941, the patient again returned to the eye clinic suffering from a recurrence of the anterior and posterior uveitis in the left eye. The sulfathiazole therapy in the previous dosage was given every four hours, together with daily paracenteses. The eye became worse, and on July 16, 1941, the therapy was changed to sodium iodide, 15½ grains given intravenously once a week. The eye improved rapidly, and on July 28th was white except for a very faint circumcorneal injection. This had entirely disappeared by August 25th. The sodium iodide was then given every two weeks and discontinued on December 1, 1941.

Ocular examination at this time revealed the following condition: The pupils were 6 mm. in diameter and reacted well to light and accommodation. The cornea of the right eye was normal, and the lens was clear. Many vitreous floaters were seen, and a pronounced secondary optic atrophy was evident. Scattered throughout the fundus were small areas of pigment proliferation, looking very much like bone corpuscles. There was a round, white, fluffy lesion of the same size as the optic disc directly over the macula. This was elevated three diopters and the borders were lined by pigment. Below the disc and slightly nasalward was a large area of chorioretinitis surrounded by fresh hemorrhage. It was characteristic, in following these lesions from week to week, to see an area of chorioretinitis always preceded by a hemorrhage. As the hemorrhage broke down, the center became white, the periphery became pigmented, and the same process was repeated. The arteries were narrowed, but the venules were of

normal size. There was no vascular tortuosity. The fundus of the left eye appeared to be similar to that of the right, but here the optic atrophy was more marked, the bone-corpuscle arrangement more scattered, and there were more white, circular, fluffy elevated areas of chorioretinitis peripherally outlined by pigment. Many large, fibrous strands were observed in the vitreous, and an early retinitis proliferans was making its appearance. Several months later, one of us (D. T. V.) on examining the patient discovered a retinal detachment in the upper temporal quadrant.

On January 27, 1942, the possibility of a toxoplasmic infection first came to our attention. X-ray films of the skull taken on this date revealed no cerebral calcification. The sedimentation rate was normal. Blood culture and stool culture were negative. On February 11, 1942, 10 c.c. of the patient's blood was sent to Dr. A. B. Sabin at Children's Hospital for examination with a view to a possible infection by the Toxoplasma parasite. On February 20th, Dr. Sabin reported that the blood was positive for this disease. He suggested that the patient be given sulfathiazole or sulfapyridine in sufficient dosage to keep the blood level at 2 to 3 mg. percent over a long period of time, possibly six months. The blood level during the previous course of sulfathiazole therapy had been kept at 2.5 mg. percent.

Fluid in the amount of 2.2 minims was withdrawn from the anterior chamber of each eye and also tested for evidence of infection with Toxoplasma, but without results. Mice, injected intraperitoneally and intracerebrally, with subsequent passage into other mice, did not reveal any evidence of the parasite.

Comment. This patient possesses excellent health except for a bilateral chorioretinitis and a bilateral secondary optic atrophy, the etiology of which had been in doubt for a number of years. It was thought that the condition might have been tubercular. This case may represent a congenital infection with Toxoplasma of low virulence, or the disease may have been present and discovered only when the patient started going to school.

Case 2. H. G., a laborer aged 23 years, entered the Eye Clinic of General Hospital on August 22, 1935, stating that he had had poor vision in the left eye all of his life, but that in the past two weeks it had become worse. He had also suffered from constant headaches above the eyes.

Vision O.D. was 20/20 and O.S. 15/200. Ophthalmoscopic examination uncovered no pathologic changes except for a few fine vitreous opacities in the left eye, and a group of yellowish dots about the macula. The patient was not seen again until March 24, 1936, when he was referred to the Hospital for treatment of central chorioretinitis of the left eye. Typhoid vaccine given intravenously was without appreciable effect. A complete physical examination shed no light on the etiology. Wassermann and Kahn tests were negative. The urine was negative for albumen and sugar. Hemoglobin was 80 percent, the red-blood-cell count normal, and the white-cell count, 10,300. X-ray films of the sinuses and chest were negative.

On August 4, 1936, the lesion appeared to be quiescent, and the patient was requested to return in one month. He was, however, not seen again until May 6, 1940. Vision O.D. was 20/15 and O.S. 20/200. The left eye revealed an old area of central chorioretinitis covering the macula. The center was grayish-black, and a small hemorrhage was seen near the temporal border. There appeared to

be a heaping up of the pigment just above the lesion. Mild edema surrounded the area. The patient gave a markedly positive reaction to intracutaneous injection of first-strength Old Tuberculin, and was therefore placed on tuberculin therapy (O.T.) beginning with 0.000003 mg. and continuing once a week on a slightly increasing dosage until October 25, 1941. On February 8, 1941, the lesion first exhibited marked reactivity. The grayish-black center was raised and a large choroidal hemorrhage appeared below the margin of the area. On February 15th, another large hemorrhage appeared just above the lesion. The latter gradually healed in the center and spread toward the papilla. On November 29, 1941, the center was grayish-black surrounded by healed grayish-white scar tissue; several small choroidal hemorrhages superior to the area were undergoing absorption. On March 28, 1942, the lesion had reached the inferior border of the disc. Two weeks previously the patient was found to have neutralizing bodies against Toxoplasma.

Case 3. J. S., a white girl, aged 12 years, was first seen at Children's Hospital on July 16, 1940. She complained of poor vision and of a dark spot in front of her eyes.

Vision was 20/40 O.U. Myopic astigmatism was found and vision corrected to 20/20 O.U. Ophthalmoscopic examination revealed an inactive chorioretinitis in the right eye just inferior to the disc. It was yellowish-brown in color and measured one-half disc diameter in width and one disc diameter in length. There was no aqueous flare and no cells were seen in the anterior chamber. The left eye revealed no evidence of pathologic change. On October 11, 1941, the lesion was larger, and pigment had been deposited about the periphery. Complete physical examination and X-ray studies of the teeth failed to reveal any foci of infection. On March 28, 1942, examination of the right eye revealed the following data: The pupil was 3 mm. in diameter and reacted to light and accommodation. The lens was clear, and there were a few vitreous floaters. The papilla was normal in color and outline and presented a slight physiologic excavation. The lesion was now grayish-brown in color surrounded by black pigment. It measured one disc diameter horizontally and three disc diameters vertically. The retinal vessels passed to the periphery of the lesion but not across it. The inferior temporal vein had been pushed temporalward by the advancing margin of the lesion. Three other heavily pigmented areas of chorioretinitis had made their appearance, one located nasally, one inferior and temporal, and the third just temporal to the large lesion. A venule passed over this last area without being displaced. A small hemorrhage had appeared at the temporal border of the large lesion. The macula was normal. The left eye was normal except for a few vitreous floaters. Muscle balance was normal. The sera of both patient and her mother possessed neutralizing bodies against Toxoplasma.

Case 4. C. S., a white boy, aged seven years, was seen in Children's Hospital Clinic on March 31, 1942. The parents stated that "the child's eyes had been poor and the right eye had turned in since birth."

Examination revealed 20 degrees of esotropia in the right eye, the ocular movements being comitant. Ophthalmoscopic examination of the right eye revealed a disseminated chorioretinitis with secondary optic atrophy. There was a larged healed area of chorioretinitis tem-

poral and inferior to the macula. The left eye also revealed a disseminated chorioretinitis with secondary optic atrophy. There was a slight pigmentary change in the macula. The patient was found to have compound myopic astigmatism, the visual acuity O.D. and O.S. was 20/200. Vision was corrected to O.D. 20/50 and O.S. 20/30.

The Wassermann test was negative, and X-ray studies of the skull revealed no areas of calcification. Toxoplasma neutralization tests were positive for the patient and the mother.

Case 5. C. C., a white boy, aged seven years, had had esotropia in the right eye since infancy. Childhood diseases included measles, varicella, scarlet fever, and pertussis.

Visual acuity was O.D. 20/200 and O.S. 20/70. Under atropine refraction the right eye was found to be emmetropic and the left eye required +0.50D. sph. This improved vision to 20/50. No glasses were ordered. The pupils were equal and regular, and reacted well to light and accommodation. There was 10 degrees of right convergent strabismus, which was not constant, the eyes occasionally approaching parallelism.

Ophthalmoscopic examination of the right eye revealed a disseminated chorioretinitis, the lesions being small, white, and surrounded by pigment. One large area of chorioretinitis surrounded by pigment was near the macula. The retina and choroid were atrophic. The left eye revealed several small atrophic chorioretinitic areas and a large pigmented area inferior to the macula.

Complete physical examination was negative, as were also the Wassermann and tuberculin tests. The urine was negative for albumen and sugar. X-ray studies of the skull showed a small calcification in the right parietal area of the brain. Neutralization tests for Toxoplasma were positive for both the patient and his mother.

Case 6. F. W., a white girl, aged 16 years, entered the Eye Clinic of the Cincinnati General Hospital on March 9, 1942, with the complaint that "vision in my left eye has been failing since the summer of 1940." Vision in the right eye was 20/20 and in the left eye 20/200.

External examination revealed no evidence of pathologic change. The pupils were 3 mm. in diameter, equal and regular, and reacted to light and accommodation. The lens was clear, and the media were normal in each eye. The fundus of the right eye was normal. The fundus of the left eye revealed an irregular grayish-white area of chorioretinitis over the macula. The lesion was inactive. Examination of the periphery of the fundus under atropine failed to reveal any other evidence of pathologic change. Physical examination was negative as were the Wassermann and tuberculin tests. X-ray studies of the skull were negative, those of the sinuses disclosed a mild bilateral ethmoiditis for which the patient was treated in the Nose and Throat Department. Neutralization tests for Toxoplasma were positive. Numerous examinations of the fundus over a period of three months failed to reveal any activity of the lesion.

Comment

In five of the cases, the condition was probably congenital; in the sixth case it was without doubt acquired.

Although the patients in cases 3, 4, and 5 proved to be positive for the Toxoplasma neutralization test, nothing characteristic was found in the fundi that could classify them as typical of Toxo-

plasma. It was not because no foci of infection could be uncovered but that the test was positive for toxoplasma that this diagnosis was made. No keratitic precipitates were found on the posterior surface of the cornea in these cases. There was macular involvement in some, but not in all. A few of the lesions have grown larger over a period of time while others have remained inactive. In all three of these cases the mother was also found to be positive for this condition.

The skull pictures showed nothing significant except in case 5. The tiny calcification was in the brain tissue and not in the skeletal formation.

Sabin has also found that occasionally the serum of the father or older siblings was also positive, thus suggesting a high incidence of associated familial, mild, or subclinical infection. It is highly significant that in 9 out of 10 cases of chorioretinitis reported by Sabin (including those herein described) positive neutralization tests were obtained. Three cases occurring in adults, aged 33, 46, and 59 years, have not yet been reported. These are undoubtedly acquired cases of Toxoplasma.

Our present data do not permit a statement as to the incidence of Toxoplasma neutralizing antibodies among the general population, but it is evidently more prevalent than we had realized. Many cases of chorioretinitis formerly diagnosed as tubercular, metastatic, or of unknown etiology may be due to Toxoplasma, especially if associated with cerebral calcification. Any pathologic condition of the eye in which the etiology remains obscure may well merit the attention and care that is necessary in the diagnosis of this disease.

Summary

Six cases of chorioretinitis of previously unknown etiology are reported in which the presence of positive neutralization antibodies for Toxoplasma was proved. The condition may be either congenital or acquired. The only symptom may be that of poor or decreasing vision. The fundus usually reveals a chorioretinitic lesion, unilateral or bilateral, having a predilection for the macular area. It has a grayish-white center, is irregular, bordered with dark pigment, and surrounded on one or more sides by faint choroidal hemorrhage. The spread of the lesion is usually in the direction of the hemorrhage. The lesion may be elevated. Iridocyclitis, vitreous opacities, retinitis proliferans, and detachment of the retina may result. Central vision is always adversely affected.

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PARINAUD'S OCULOGLANDULAR SYNDROME*

Report of two cases

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In 1889 Parinaud[1] described an infectious conjunctivitis of animal origin, usually occurring in one eye. Clinically the condition described is characterized by a granular conjunctivitis with actual ulceration and early swelling of the parotid and anterior cervical lymph glands. The infection is accompanied by moderate fever, which is irregular in nature. The disease is almost invariably unilateral, the cornea is never attacked, and recovery takes place within a few weeks to six months.

Parinaud reported no pathologic findings and defined no bacteriology. Many descriptions of pathologic findings followed, none containing anything specifically determinate and each one differing from the other. For some time bacteriologic investigations were all negative.

It has been common practice to classify as Parinaud's disease cases of obscure chronic conjunctivitis associated with vegetations and ulcers and with regional lymphadenitis, little or no attempt being made to run down the etiologic factors. This fact was pointed out by Hoor[2] as early as 1906. Recently, however, more and more etiologic factors are being discovered, and the term Parinaud's conjunctivitis has been used to describe several clinical entities.

Many types of causative agents may induce the clinical picture of Parinaud's conjunctivitis. Infection of the conjunctiva by B. tularense is manifested by a similar clinical picture except that the systemic reaction is much more severe and the disease much more abrupt in its onset. Longchampt and Reboul[3] suggested that a virus derived from animals may be responsible for some cases. Morax[4] thought the condition was tuberculous in nature. Syphilis of the conjunctiva in the primary stage, even though the conjunctival lesion is, as a rule, quite typical of a chancre elsewhere on mucous membranes, in some instances may resemble the clinical picture of Parinaud's conjunctivitis.

The most frequently demonstrated etiologic agent that induces this clinical picture is the Leptothrix. In 1904 Verhoeff and Derby[5] described a subacute nodular unilateral conjunctivitis with regional lymphadenitis, characterized his-

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tologically by localized infiltrations with macrophages loaded with broken-down chromatin. These latter proved to be Leptothrix as demonstrated by Verhoeff[6] in the conjunctival lesions. In 1918 Wherry and Ray[7] demonstrated the Leptothrix in the preauricular glands. This finding was confirmed by Lemoine[8] in 1924, by Gifford[9] in 1927, and by Gifford and Dillon[10] and by Harner[11] in 1934. The organism was grown in pure culture by Verhoeff and King[12] in 1933, and animal inoculation produced positive results.

Duke-Elder[13] states that any case presenting the clinical picture of a unilateral conjunctivitis with lymphadenopathy should be subjected to the following tests:

1. Smears and cultures, which may show Sporothrix or Leptothrix.
2. Guinea-pig inoculation with conjunctival scrapings, which may show tularemia, tuberculosis, or other organisms.
3. Partial excision for histologic examination, which may show Leptothrix or tubercles.
4. Blood examination for Wassermann reaction and an agglutination test for tularemia.

In many instances the etiology is unknown or questionable. Two cases are here reported. In the first the etiology is questionable and in the second unknown.

Case reports

Case 1. Mrs. A. O., aged 33 years, an assistant cook in a fraternity house, was first seen October 11, 1941, complaining of swelling and redness of the right eye, with watery discharge. These symptoms had first been noticed about 10 days previously and shortly after she had been caring for a pet cat with sore eyes. She stated that she had greased her cat with lard and that the animal had made an uneventful recovery. Coincidental with the swelling of the lids she noticed swollen, tender preauricular and submaxillary glands on the right side. Except for a feeling of fatigue and a slight headache, there were no general symptoms.

Examination: On examination she did not appear ill, although she said she was feeling a little more tired than usual that day. Her temperature was 99.8°F., and her pulse rate 96. The right preauricular and anterior cervical glands were enlarged and tender.

The left eye was normal. The right eye presented moderate swelling of the lids, with some ptosis of the upper lid. Eversion of the lower lid revealed the palpebral conjunctiva to be hyperemic but not edematous. There was considerable edema of the bulbar conjunctiva, which was most marked in the lower one half. The caruncle was edematous. Eversion of the upper lid revealed the bulbar conjunctiva above to be only slightly edematous. This was most marked near the upper cul-de-sac. The upper palpebral conjunctiva presented a granular tumefaction that protruded from the upper portion of the tarsal plate. This extended from the middle third to the outer canthus and upward into the superior cul-de-sac. The surface of this mass was irregular, and near the junction of the middle and outer third there was an ulcer about 2 mm. in diameter. The cornea was clear. The anterior segment and fundus were normal. Vision was 6/6—1 without glasses.

Treatment and Course: Smears taken with a platinum spatula showed many pus cells but no bacteria. Giemsa stains were made and no eosinophiles were seen. Secretions taken with a platinum loop, planted on blood agar, and incubated at 37°C. for 48 hours, showed no growth. A guinea pig, inoculated with material obtained from the ulcer, remained well and was killed three weeks later for autopsy. No lesions were found. A biopsy specimen of the lesion was taken and sent to the pathology laboratory of the Department of Ophthalmology of the

University of Iowa; neither Leptothrix nor tubercles were found. The Wassermann test was negative. A strongly positive reaction for tularemia was reported by the Nebraska State Health Department. Subsequent agglutinations from specimens drawn at intervals of three to four days were reported negative for tularemia.

Local treatment consisted of daily topical applications of 2-percent silver nitrate and the instillation of 5-percent sulfathiazole ointment twice daily. The patient was seen on the average of once every two days. Her improvement was gradual and her temperature ranged between normal and 99.8°F. The conjunctiva appeared almost normal except for some redness, 26 days after she was first seen, and the glandular swelling had almost disappeared. She returned to the office on January 2, 1942, approximately three months after the onset, at which time complete recovery was noted.

Case 2. G. B., a school boy, aged 13 years, was first seen on December 2, 1941, complaining of pain and swelling in the left preauricular region and redness of the left eye. About six days before there had been some discomfort in the left eye, with tearing. A more careful history revealed that three weeks prior to coming to the office he complained of a headache and earache on the left side. He was tired and slept much of the time. His appetite was poor, but there was no nausea nor vomiting. He complained that his eye hurt him and dark glasses were worn for relief. The morning of November 27th, six days before coming to my office, he awakened with pain and swelling in front of his left ear. This swelling gradually increased up to the time he was first seen. His temperature was not taken at home, but the mother thought he had had some fever. There were no chills.

Examination: On examination the boy did not appear especially ill. He was quite small for his age and looked somewhat frail. His temperature was 99.8°F., and his pulse was 92. The right eye was normal. The left preauricular and anterior cervical glands were swollen and tender (fig. 1). The left eye presented a slight

Fig. 1 (Wood). Parinaud's oculoglandular syndrome, showing preauricular adenitis.

fullness of the lower lid near the outer canthus, and there was some narrowing of the palpebral fissure. Eversion of the lower lid revealed moderate hyperemia of the palpebral conjunctiva. On the lower external quadrant of the bulbar conjunctiva was an edematous, raised, gray area measuring approximately 8 mm. in diameter, which extended downward into the lower cul-de-sac and forward for a short distance onto the conjunctiva of the lower lid (fig. 2). The surface of this raised area was irregular, but no definite ulceration presented itself. The gray swelling extended downward into the lower cul-de-sac. Surrounding this larger raised gray area were many small pinpoint white spots, about 1 mm. in diameter. In all there were some 8 or 10 of these small spots. The upper lid was normal as were the cornea, the anterior segment, and the fundus. Vision was 6/6−1 without glasses.

Treatment and Course: Cultures, taken from the lesion with a platinum loop, planted on blood agar, and incubated at 37°C. for 48 hours, showed one colony

of nonhemolytic Staphylococcus albus. Smears taken with a platinum spatula and stained with the Gram and Giemsa stains showed many leukocytes, three of which took the eosin stain. Scrapings were taken from the ulcer, and a guinea pig was inoculated. The animal was killed after six weeks and found to be normal. A biopsy specimen was taken from the center of the lesion and sections were made by the pathology laboratory of the Department of Ophthalmology at the University of Iowa. No Leptothrix nor tubercles were found. The Wassermann test was negative. Repeated samples of blood gave negative tests for tularemia throughout the course of the illness. The differential count was insignificant, except for the presence of a 6-percent eosinophilia. The Mantoux test was negative, as was a blood culture taken December 9, 1941.

Fig. 2 (Wood). Parinaud's oculoglandular syndrome, showing the lesion on the bulbar and lower palpebral conjunctiva.

The patient was admitted to Bryan Memorial Hospital on December 3, 1941, and discharged on December 24, 1941. During his stay in the Hospital the ocular lesion gradually improved, but the adenitis persisted. For the first seven days the temperature ranged between 100° and 103°F. The temperature gradually subsided during the following week and was never over 100°F. rectally. On December 9, 1941, the preauricular glands were aspirated, and a few flakes of pus obtained for smears and cultures. Smears stained by the Gram and Giemsa technique showed many leukocytes but no microörganisms. Some of the material was planted on blood agar and some on Saboraud's medium. No growth occurred on either medium.

After the patient's discharge from the Hospital the conjunctival lesion was treated by daily topical applications of 5-percent silver nitrate. He was last seen on January 8, 1942, at which time the conjunctival lesion had almost completely healed without scar formation, but there still remained one rather firm lymph node about the size of a 5-cent piece, in the left preauricular region. Generally the boy appeared well and he had returned to school.

Comment

It is probable that the causative agent in the first case was the B. tularensis. A positive agglutination for B. tularen-

sis in the second week of the disease was significant, but subsequent negative agglutinations made the diagnosis of tularemia questionable. A low-grade febrile reaction with a rather mild clinical course indicated a nonvirulent infection as contrasted with the usual more severe clinical course in ocular tularemia. It is probable that the causative agent was not determined in the second case, due to lack of sufficient material to make a positive diagnosis. In my eagerness to make a diagnosis a very large piece of tissue was taken from the lesion but this may not have been representative of the true lesion. No attempt was made to culture the Streptothrix. If this had been done a positive diagnosis might have been made. The isolation of nonhemolytic Staphlococcus albus is not significant, since it is generally agreed that this organism is nonpathogenic for the conjunctiva.

The systemic reaction in the second case was somewhat more severe than is seen in the usual case of oculoglandular infection that is not caused by B. tularensis. The lesion of the conjunctiva closely resembled those described by Verhoeff[14] in Streptothrix conjunctivitis, the important feature being the absence of ulceration of the gray raised areas as contrasted to ulceration in conjunctival tularemia.

The presence of a 6-percent eosinophilia is interesting in the second case. Hurst[15] reported a blood eosinophilia of from 3 to 9 percent in 5 of 23 cases reported. In four of these five the Leptothrix was found in tissue removed for microscopic examination.

Excision of a piece of tissue for microscopic study seemed to hasten the recovery in the first case but seemed to delay recovery in the second patient.

In no case reported in the literature has there been any impairment of vision. Vision was not affected in either of these cases. The infection is often of considerable concern to patient and ophthalmologist as well, and for this reason an early diagnosis should be made in order to relieve the anxiety and discomfort of the patient.

Summary and Conclusions

Two cases of Parinaud's conjunctivitis, which were subjected to several laboratory tests without establishing a positive diagnosis, are reported.

The first case is unusual in that a positive agglutination test for tularemia was followed by repeated negative reports. In the second case the clinical course was more severe than usual in this type of infection.

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Discussion

Dr. W. Howard Morrison: Dr. Maynard A. Wood's first presentation, that of oculoglandular tularemia, adds another case to that rather infrequently reported disease. Conjunctival tularemia, first reported by Vail in 1914, can really be called the first American disease of the eye. Wherry and Lamb isolated from Vail's patient a very small pleomorphic, gram-negative, nonmotile, nonspore-producing aerobic organism which proved to be the causative bacterium in tularemia.

This disease not only occurs in an ulcero-glandular type but also in a typhoid form. The typhoid form is frequently acquired by laboratory workers. Death may occur in the typhoid form.

The agglutination test, with which Dr. Wood made the diagnosis of tularemia, is accurate, but not positive until 7 to 10 days after the beginning of the infection; this procedure, however, now has been quite definitely proved inaccurate.

The cause of the disease in Dr. Wood's second case was not determined. You will, however, note that a biopsy specimen was taken, and Verhoeff's stain was employed.

Verhoeff and King in 1913 ascribed three cases of Parinaud's oculoglandular syndrome to a Leptothrix. By a special gram stain they demonstrated the Leptothrix in areas of cell necrosis. They grew the Leptothrix in pure culture on artificial media, in which partial oxygen tension was maintained. After the original growth ordinary media would permit flora to develop.

Case report. A well-nourished boy, aged 9 years, was brought to us on October 17, 1941, complaining of a sore left eye of one day's duration. Several days before he had played with a Belgian hare which had a sore foot.

Examination. Right and left vision, uncorrected, was 20/20. The right eye appeared normal.

Left Eye. In the left inferior temporal fornix was a pea-sized irregular mass with a white, ulcerated-appearing area in its center. A walnut-sized, red, left preauricular gland was seen. It was hard and tender on palpation.

Physical and laboratory examinations were all negative. This was particularly true of several agglutinations for tularemia. The biopsy specimen, culture, and microscopic studies of the infected area were also negative.

Sodium sulfathiazole ointment, 5 percent, was prescribed, and the use of local heat advised.

The preauricular mass became larger, reaching the size of a baseball. In the meantime a pea-sized tumor mass developed in the right axilla and in the right supratrochlear region. The child ran a temperature up to 101°F. orally.

On November 17th, approximately four weeks after the beginning of the disease, the preauricular gland was aspirated. Two ounces of thick, greenish-yellow pus were obtained. Microscopic and culture studies revealed a pure strain of Staphylococcus aureus. Dilute iodine was injected into the gland. The glandular mass remained large and tender until an incision was made, on December 1st. A large quantity of purulent material escaped. The convalescence was uneventful. The gland rapidly reduced in size; the axillary and preauricular glands became unpalpable. The eye on January 10th appeared normal, the fornix mass having disappeared. This, then, is a case of Parinaud's oculoglandular conjunctivitis caused by a hemolytic staphylococcus.

ARTERITIS OF THE TEMPORAL VESSELS ASSOCIATED WITH LOSS OF VISION*

Report of two cases

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Arteritis of the temporal vessels is a distinct clinical entity which generally affects elderly persons. It is essentially an arteritis and periarteritis of the temporal vessels characterized by hard cordlike thickening of the temporal arteries along which are easily palpable nodes and painful tender areas over the temple and scalp. It is accompanied by headache, general malaise and lassitude, weakness, fever, night sweats, anorexia, loss of weight, anemia, and mild leukocytosis.

Arteritis of the temporal vessels was reported from the Mayo Clinic in 1932. Two additional cases have been recently observed in which loss of vision due to vascular disease was associated with the temporal arteritis.

Report of two cases

Case 1. A poorly nourished saleswoman, aged 61 years, registered at the Mayo Clinic on December 6, 1938. She complained of complete loss of vision in the left eye, diminution of vision in the right eye, and marked weakness. Fatigue and anorexia, the first symptoms, had appeared six months before admission. These symptoms had become progressively more marked. Three months later she had experienced a sickening pain about the top of the head and just above the forehead. This pain extended toward the temples, was intermittent, and became progressively more severe for two months. Her scalp became tender to the touch. The pain in the head was associated with nausea and eventuated in a severe episode of vomiting that lasted for five days. Because of this she was hospitalized in her home town, where she was found to have anemia and a slight elevation in temperature. A diagnosis was not made. During hospitalization she had noted that the vessels about her temples had become prominent and exquisitely tender to touch. She described the temporal pain at this time as severe, paroxysmal, lancinating, and extending about her eyes and cheeks. During the intervals between episodes of pain she would feel well but exhausted. On awakening, two weeks before registration at the Clinic, she had noticed diminution of vision in the right eye. Three or four days later vision had returned to normal but she then had noted inability to see in the lower half of the field of vision of the left eye. One week later the field in her right eye became reduced, as though she were looking through a slit. During the ensuing few days the remainder of vision in the left eye had disappeared.

On examination at the Mayo Clinic the vision was 6/6 in the right eye and vision in the left eye was reduced to perception of light. The field of the right eye revealed loss of the superior nasal quadrant and general constriction; in the ocular fundus several ischemic regions were present along the superior temporal vessels, but the changes in the field were out of proportion to those in the fundus. In the fundus of the left eye occlusion of the upper branches of the central retinal artery and vein with fragmentation of the

*From the Mayo Foundation and the Mayo Clinic.

blood stream was noted. Ischemic edema of the disc, which was elevated 2 diopters at the upper pole, was present. Again, the loss of vision appeared out of proportion to the ophthalmoscopic findings.

Neurologic examination gave essentially negative results except for the eyes. Laboratory examinations also revealed nothing abnormal except secondary anemia. A diagnosis of temporal arteritis was made at this time. Five days later the vision in the left eye had improved until the patient could count fingers and a vasodilator drug (acetyl-β-methylcholine chloride) was given. Curiously enough, at the time of the injection of the acetyl-β-methylcholine chloride, the remaining vision in the left eye was reduced while that of the right eye apparently was unaffected.

Two weeks after admission the edema of the disc of the left eye had subsided, leaving pallor, grade 3 to 4, of the disc. A portion of the left temporal artery was removed by Dr. Craig and the pathologic appearance was that of a chronic inflammation with occlusion of the lumen, partial necrosis of the media, and lymphocytic infiltration of the adventitia. When the patient was dismissed six days after the operation, the ocular condition was essentially unchanged except for some widening of the fields of the right eye.

In a recent letter the patient stated that her general condition was satisfactory, that the vision in the right eye was good, and that the vision in the left eye had remained unchanged.

Case 2. The patient, a white farmer, aged 75 years, registered at the Clinic on March 9, 1942, because of sudden loss of vision in the left eye. He had been examined at the Clinic in 1932 and again in 1935. On both occasions a diagnosis of myocardial degeneration and cardiosclerosis had been made. The patient stated that about three weeks before his present registration he had had a dull, boring, left frontotemporal headache. The headache had continued, and about one week after onset several hard, tender nodules about the size of a navy bean had appeared on the anterior portion of the left temporal region. The temporal pain had persisted, and one week before admission he suddenly had lost all vision in the left eye. Three days later several small nodules had appeared on the anterior portion of the right temporal region. These nodules were tender and their appearance had been preceded by right frontal headache.

The vision of the right eye was limited by a dense corneal leukoma to perception of movements of the hands. Vision was completely gone from the left eye. Ophthalmoscopic examination under wide dilatation revealed an essentially normal fundus of the right eye with the exception of mild retinal arteriolosclerosis. In the left eye the optic disc was mildly edematous and slightly pale. From the temporal margin an irregular, whitish, slightly raised region of exudation extended out approximately 1 disc diameter. Several small hemorrhagic extravasations were present along the superior nasal vessels and above the disc. The retinal arterioles on the nasal side of the disc appeared pale, and narrowing was graded 2. Otherwise, the condition of the retinal arterioles was the same as in the right eye.

General examination revealed secondary anemia, myocardial degeneration, cardiosclerosis, and bilateral temporal arteritis. On the evening of the day of registration at the Clinic, exacerbation of headache in the right frontal region was accompanied by sudden complete loss of vision in the right eye. Examination of the fundus three days later revealed no local cause for the blindness.

In this case also the mode of onset of the loss of vision suggested occlusion of

the arterial blood supply to the optic nerve or retina, but the visible evidence of vascular occlusion in the fundi was insufficient to explain the complete loss of vision. It must be assumed, therefore, that the occlusive episode had occurred in vessels too far back in the optic pathways to produce visible lesions in the retina.

The anterior deep temporal arteries have an anastomosis with the lacrimal branch of the ophthalmic artery. The ophthalmic artery gives off the central retinal artery, which sends an anterior and posterior branch to the optic nerve.[1] It would be conceivable that the inflammatory process in this case had traveled in this direction.

Comment

Twenty cases of arteritis of the temporal vessels have been observed thus far at the Mayo Clinic since the presentation of this subject, approximately 10 years ago.[2, 3, 4] Blindness has been a complicating factor in only these two cases. In the literature 17 additional cases have been reported since the original publication of Magath, Brown, and one of us (B. T. H.).

Diminution of vision has been noted in four of these cases. In 1938 Jennings and Comb[5] reported one case of temporal arteritis in which complete loss of vision of the left eye occurred during a period of five days. The disc was pale and contained a small central hemorrhage. Observation nine days later showed complete obstruction of the central retinal artery of the left eye. The vision in the right eye rapidly deteriorated, the disc became pale, and there was a small hemorrhage below and near the disc. Observation of the fundus of the right eye, eight days later, showed "progressive obliteration of the right central retinal artery with especial narrowing of its upper branches." In 1940, Dick and Freeman[6] reported two cases of temporal arteritis, in both of which blurred vision occurred in one eye. In the first case reduction of the visual field, enlargement and edema of the disc, and a small hemorrhage on the disc of one (the left) eye were present. Details were not given concerning the second case. Scott and Maxwell[7] in 1941 reported a case of temporal arteritis in which the vision in the right eye was lost and in which there was some diminution of vision in the left eye. The fundus of the right eye could not be seen because of lenticular opacity, and that of the left eye showed only small patches of exudate in the peripapillary area. This patient had high concentration of sugar in the blood. Dr. Reuben A. Johnson[8] of Minneapolis, Minnesota, reported to one of us (B. T. H.) that he now has under observation a woman 80 years of age who has temporal arteritis, and has lost the vision in one eye.

We always have suspected that the arteritis in this condition was more extensive than could be detected on careful physical examination. Recent observations confirm this impression. Aside from the blindness in these two cases, neurologic examination of patients with arteritis of the temporal vessels has given essentially negative results.

The etiology of arteritis of the temporal vessels is still unknown. Work is now in progress at the Clinic which may throw some light on this obscure condition. Microscopic examination of resected vessels for the most part indicates a chronic inflammatory process, and yet in a number of instances the microscopic appearance might be explained on the basis of a degenerative type of process. The general clinical picture, however, and the presence of such symptoms as headache, general malaise, lassitude, weakness, fever, night sweats, and mild leukocytosis

over a long period certainly suggest some chronic infectious process. This does not explain why the disease is confined almost entirely to the older age groups. The average age of the 20 patients observed at the Clinic was approximately 65 years, and the age of the patients whose cases are reported in the literature is essentially the same.

The fact that all patients have finally made a good clinical recovery is of especial interest. None of the patients encountered at the Clinic nor those whose cases have been reported in the literature have succumbed to this disease. We know of no specific treatment for this syndrome.

Since the writing of this paper we have seen a third case. A woman, aged 76 years, was admitted to St. Mary's Hospital on September 19, 1942. She complained of complete loss of vision in the right eye and partial loss of vision in the left eye. She stated that in May, 1942, she noticed stiffness of the whole vertebral column. This was accompanied by malaise, weakness to the point of fainting, sweating, loss of appetite, nausea, vomiting, and loss of 30 pounds (13.6 kg.) in weight. In May or June she noted that her temporal arteries became swollen, nodular, red, and somewhat tender. This was more marked on the right. Her general condition began to improve somewhat during the latter part of August. On September 6, 1942, she noted two small scotomata before her right eye. These gradually enlarged and by the following morning there was a large central scotoma. In a few seconds the eye was completely blind and remained so. On September 17th, the patient was given typhoid vaccine intravenously, and on the following day she felt that there had been partial loss of vision in her left eye.

General examination revealed a well-developed white woman who had generalized arteriosclerosis. Both temporal arteries were prominent, nodular, and irregular; they were thrombosed and did not pulsate. The tenderness had all disappeared. Neurologic examination was negative except for the eyes. There was no vision in the right eye; in the left eye vision was 3/30. The field of the left eye showed a superior arcuate scotoma which began at the upper margin of the normal blind spot and involved the entire superior nasal quadrant. Examination of the fundus of the right eye revealed a rather pale disc mildly edematous nasally. There was an area of localized edema of the retina between the disc and macula. The fovea appeared slightly reddened and was suggestive of a residual cherry-red spot. The lower nasal retina appeared ischemic. The optic disc of the left eye showed 1 diopter of edema, and the lower temporal quadrant of the disc appeared rather pale. The veins were engorged.

Since the patient was not seen until two weeks after the onset of blindness in the right eye, it is impossible to tell the exact mechanism of the loss of vision, but the appearance of the fundus would suggest that probably the central retinal artery was occluded. Examination of the fundus of the left eye together with the mode of onset and the field defect suggests that the loss of vision was on the basis of a vascular thrombosis in the optic nerve itself.

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THE PIGMENT OF THE KAYSER-FLEISCHER RING*

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The Kayser-Fleischer ring, a deposition of a greenish-brown pigment in Descemet's membrane, is found in association with hepatolenticular degeneration, the so-called Wilson's disease. This pigment has been subjected to intense study in the hope of finding some explanation of the etiology of this syndrome. Holloway and De Long[1] reported a case in 1929. At this time they summarized two previous similar chemical studies that had been made in which conflicting properties had been ascribed to the corneal pigment. They considered the pigment to be colloidal silver. Poe[2] reported a case in 1930, at which time a review of the literature and a color plate showing the pigment were presented. He attributed the pigment to toxic substances, set free by the cirrhotic liver, that reached the aqueous in small quantities over a long period of time. Dunnavan and Motto[3] gave a complete review of the literature and also included a color plate showing the pigment in their case. In the past year, we have had the opportunity of observing two cases of Wilson's disease, with typical Kayser-Fleischer rings. The patients in both cases came to autopsy, so that it was possible to make chemical studies of the pigment. Since this substance is present in such small amounts, and therefore staining properties might be insufficient to disclose its true nature, spectographic analysis seemed to offer the best hope of studying the pigment.

A brief history of each of the two cases is given below:

Case 1 (case of I. H. S.). B. R., a 17-year-old white male, was first admitted to the University Hospitals on October 9, 1940, because of vague abdominal pains. At this time, cirrhosis of the liver, secondary anemia, and deflection of the nasal septum were diagnosed. On the 17th of the same month, a submucous resection for correction of the septal defect was performed. He was discharged to the O.P.D. on October 26th.

He was referred to the Eye Clinic on January 2, 1941, because of eye strain and headaches. Examination at this time revealed a faint brownish-yellow ring, encircling the cornea at the limbus, more marked in the left eye. Slitlamp examination revealed that the pigment was located on the posterior corneal surface, just an-

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terior to Descemet's membrane, with slight infiltration into the stroma in some areas. In several places the pigment extended through onto the anterior corneal surface. The pigmentation extended about 2 mm. on the cornea. The impression of the examiner (I. H. S.) at this time was that the pigmentation represented the Kayser-Fleischer ring of hepatolenticular degeneration.

On April 28, 1941, six days after the removal of a tooth, the patient was readmitted to the Hospital because of pain in the epigastrium, fever, and malaise. Examination at this time revealed signs of bronchopneumonia on the left, with decreased expansion on the left, dullness to percussion at the left base and in the left axillary region. Breath sounds were absent in this area. Tympani to percussion were found as high as the fifth rib to the left of the sternum anteriorly. The temperature was 40.5°C., pulse 140, respirations 26, and blood pressure 140/70. The liver was palpable, the icteric index 22, and the white blood cell count 17,700. Reaction to the Van den Bergh test was direct immediate, and the amount of bilirubin 3.62 mg. percent. The plasma proteins were 5.86 gm. percent, albumin 1.63 gm. percent, globulin 4.23 gm. percent, the A/G ratio 0.39. The patient became comatose on the night of admission and died on the third day of hospitalization.

Even though this patient showed no clinical evidence of lenticular degeneration, microscopic post-mortem examination revealed degenerative changes in the globus pallidus, especially in the region of the lentiform nucleus. Cirrhosis of the liver (Laënnec's) and bilateral bronchopneumonia were confirmed at autopsy. It is interesting to note that three brothers and one sister of the patient were said to have died of cirrhosis of the liver. In the case of one brother, the diagnosis was confirmed at autopsy. It is also interesting to note that a history of chronic alcoholism in the parents, and poor diet by the patient for eight years, was obtained.

Case 2 (case of A. B. A.). J. B., a white man, aged 28 years, had several admissions to the General and Psychopathic Divisions of City Hospital, and had been followed in the Neurological Department of the O.P.D. for the last three years. When he first came in some three years ago, he complained that six years previously he had been beaten severely over the head and back with a blackjack, and that two weeks following this he began to have a tremor of the head and of the left hand. Also about the same time he began to notice some difference in walking, with a tendency to fall forwards as he walked along. No noticeable tremor of the legs was present at this time. About eight years ago, it was first noticed that he was having some difficulty with his speech, which became very slow and labored, and took on an explosive, staccato character. At this time the tremors of his head and arms had also increased considerably, as had the difficulty in walking. Rectal and vesical incontinence, headaches, and vomiting were absent.

Examination at this time revealed that the patient had a marked generalized coarse tremor of the head and both hands which occurred both during rest and on intention, becoming much more marked in frequency and coarseness in the latter case. There was generalized hyperreflexia associated with moderate spasticity of both arms and legs. On the superior margins of both corneas, there was a deposition of some brown pigment. Pupillary changes and nystagmus were absent, and the eyes were otherwise normal. All voluntary movements were performed with great difficulty because of severe ataxia. This was brought out particularly in the finger-and-nose test, and somewhat less

so by the heel-and-knee test. He walked with a very spastic gait, with a tendency to propulsion and with quite short steps (marche à petits pas). Laboratory examinations at this time, including lumbar-puncture and liver-function tests, were essentially normal.

Following this first admission to the O.P.D., the patient was carefully followed until the time of his death. During this period of observation, his symptoms as listed above appeared to grow progressively worse. There was considerable increase in the degree of ataxia, which gradually came to involve the legs as well as the arms. He was finally unable to say more than a few short words in any reasonable length of time. On November 28, 1940, he was probated and admitted to the Psychopathic Hospital because of inability to dress himself or care for his personal body habits, in addition to an increasing irritability, some loss of recent memory, and a tendency to be dysphoric. In this hospital stay, which lasted seven months, he continued to grow progressively worse in his mental and physical spheres. At no time did he show a palpable liver, and glucose tolerance and lumbar-puncture tests continued to be negative. On June 16, 1941, the patient was transferred to the State Hospital.

Shortly after his arrival there, he was taken ill with influenza, the symptoms being malaise, cough, and some fever. He remained in this state for two weeks, when he suddenly became critically ill with high fever and delirium progressing to coma. On July 10, 1941, he was returned to the Psychopathic Hospital in a stuporous and unresponsive state. Admission temperature was 41°C., pulse 168, respiratory rate 62. There was an extensive pneumonic process in the right lung. Despite therapy with sulfapyridine and parenteral fluids he died on the following day. Clinical diagnosis was hepatolenticular degeneration (Wilson's disease) and pneumonia, right. At autopsy, the immediate cause of death was found to be bilateral bronchopneumonia, and the diagnosis of hepatolenticular degeneration was confirmed.

Microscopic examinations of one cornea revealed a deposit of very dark pigment in the center of Descemet's membrane. This pigment was in the form of minute granules, so closely grouped as to form a solid line beginning just beyond the filtration angle, then gradually diminishing in intensity and disappearing. In some places an incomplete second layer of pigment was formed. The Turnbull blue preparation did not show this pigment, it having been dissolved out by some step of the procedure.

One eye of each of these patients was available for spectrographic analysis, as well as the liver in case 2. The specimens were obtained in the unfixed condition. The cornea was excised from the eyes as close to the limbus as possible. Each cornea was placed in a separate crucible, and a piece of the liver from the patient in case 2 in a third crucible. All specimens were ashed at cherry-red heat (550-600°C.) in an electric furnace for one hour. A section of normal cornea was similarly treated. All ashed specimens were then subjected to spectrographic analysis.* The analytic reports were as follows:

Normal cornea: sodium, calcium, and magnesium.

Cornea from case 1: sodium, calcium, magnesium plus zinc and copper, with a preponderance of zinc. Also a slight amount of iron.

Cornea from case 2: sodium, calcium,

* We wish to thank Mr. Poritsky of the Cleveland Wire Works Division of the General Electric Corporation, Chardon Road, Cleveland, Ohio, who obligingly performed the spectrographic analyses for us.

magnesium plus zinc, copper, iron, silver, and aluminum.

Liver from case 2: All the cations found in the cornea from this case plus lead, potassium, and lithium. These may be present in the cornea in very small amounts.

Discussion

It is not our purpose to attempt to correlate the cations found in the corneas with the etiology of this disease. For the interest of the profession, however, we felt that these results were worth reporting. It is interesting to note that the pigment deposited in the cornea in this disease may vary from case to case. Also the pigment may be more complex as regards cations than was previously believed.

Summary

1. Two cases of Wilson's disease, with typical Kayser-Fleischer rings in the corneas, are reported. A brief case history of each is given.

2. The ashed corneas from these cases were subjected to spectrographic analysis. Abnormal cations common to both cases were zinc, copper, and iron. In addition, the cornea in one case showed the presence of silver and aluminum.

3. No conclusions are drawn from these analyses, other than that the pigment deposited in the cornea in Wilson's disease may vary from case to case, even though showing certain similarities, and that this pigment may be more complex, at least in its cation composition, than was heretofore believed.

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EFFECTS OF ASTIGMATISM ON THE VISIBILITY OF PRINT*

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Although the deleterious effects of uncorrected astigmatism are appreciated by the ophthalmologist, it is probable that they are not adequately recognized and considered by many who possess such defects. This is particularly true in the case of children; and it may also be true, to some extent, of those who are responsible for the visual conditions under which children are required to perform critical and prolonged tasks of near vision.[1] Since astigmatism is widespread, any effective means for revealing the loss in vision due to this defect is correspondingly important. Furthermore, it is also probable that quantitative measures of the loss of vision due to astigmatism will also aid appreciating some of the less obvious penalties of this deficiency.

The value of precise and specific measurements of the influence of any aid or handicap to seeing has been demonstrated clearly in other fields. For example, in lighting practice, it has long been known that "large" differences in illumination are required to compensate for the inequalities in visibility among many common visual tasks. However, experience has shown that a mere qualitative and ambiguous appreciation of this fact is often ineffective in establishing adequate lighting in the work-world. For example, the level of illumination desirable for sewing on "dark" goods is often assumed to be only twice as high as that required for sewing on "light" goods. However, actual measurements of visibility, in the two cases, indicate that many times as much light is required on the dark goods as on the light goods.[2]

It will be evident from figure 1 that quantitative measurements relating visibility and illumination are needed in order to place foot-candle recommenda-

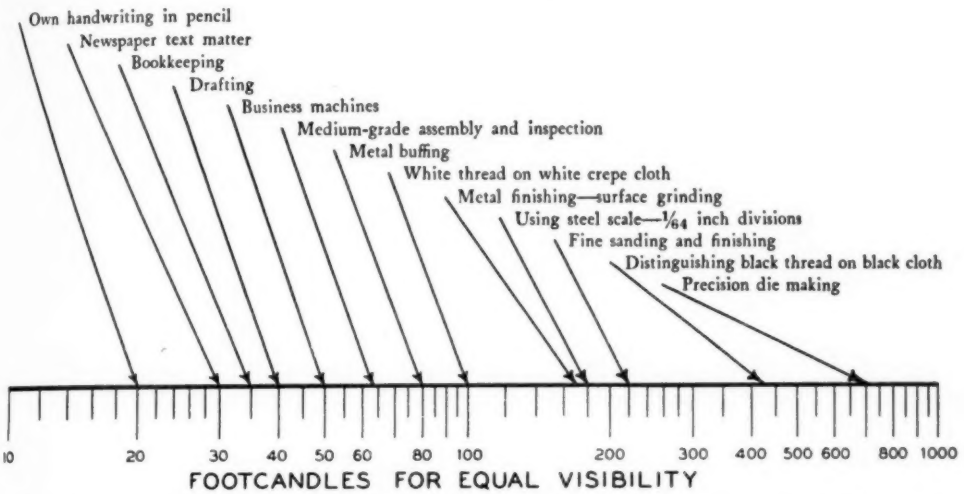

Fig. 1 (Luckiesh and Moss). Indicating the illumination required on various visual tasks in order that each be as visible as 8-point Bodoni Book type under a uniform illumination of 10 foot-candles. Normal vision and a fixation-distance of 14 inches are assumed.

*From the Lighting Research Laboratory, General Electric Company.

tions on a sound basis. These data reveal, for example, that some industrial tasks require 20 to 30 times as much light in order to be as visible as some common office tasks. However, very few observers or even workers would come to such a conclusion by inspecting the various visual situations.

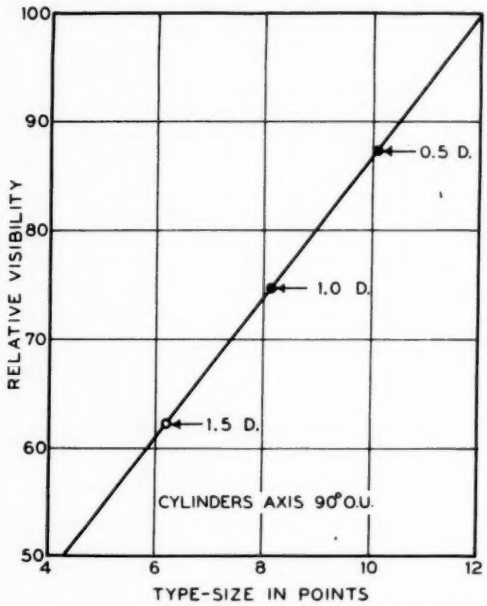

Fig. 2 (Luckiesh and Moss). The straight-line graph indicates an empirically determined relationship between visibility and type-size. The plotted points indicate (1) the relative visibility of 12-point Textype for various degrees of astigmatism, and (2) the loss in visibility due to astigmatism expressed in terms of equivalent type-size. The "open-circle" point was obtained by extrapolation.

The traditional method for expressing the loss in vision due to astigmatism is in terms of the so-called Snellen Fraction. Since many persons are unfamiliar with this notation, its general or popular usefulness as a quantitative measure of the visual handicap is correspondingly limited. However, there are numerous other scales upon which the loss in vision may be expressed. For example, it could be stated that the loss in visibility due to a given amount and form of astigmatism is equivalent to a definite reduction in the type-size of a common reading material. Thus a school superintendent, for example, might better appreciate the handicap of astigmatism if it is shown that a given astigmatic error is equivalent to a reduction in the size of the type in school textbooks of a certain definite number of typographical points.

Values for such comparisons are readily obtainable from figure 2. These data were obtained by measuring the visibility of 6-, 8-, 10-, and 12-point type with the Luckiesh-Moss Visibility Meter[3] through, respectively, plano lenses, −0.50 diopter, and −1.0 diopter cylindrical lenses placed at axis 90 degrees. All measurements were made under a uniform and diffuse illumination of 10 foot-candles by a group of representative adult subjects wearing accurately prescribed eyeglasses. A graph of these data yields the linear relationship between visibility and type-size shown in figure 2. In this case, the visibility of the 12-point type, under 10 foot-candles, is arbitrarily assigned a relative value of 100.

It will be noted from figure 2 that an addition of −0.5D. cyl. ax. 90° O.U. reduces the visibility of 12-point type from 100 percent to about 87 percent. These data also indicate that 12-point type viewed through −0.5 diopter cylindrical lenses, axis 90°, is approximately equivalent in visibility to 10-point type viewed with normal and unaltered vision. Similarly, an addition of −1.0D. cyl. ax. 90° O.U. to normal eyes results in a loss in visibility of about 25 percent. This is equivalent to a loss in type-size of about 4 points. Thus an astigmatic error of 1 diopter reduces the visibility of 12-point type to the equivalent of 8-point type. Obviously, a loss in visibiltiy of this magnitude would be extremely serious in the case of smaller type-sizes. It is also

reasonably safe to assume that few school officials, for example, would tolerate an actual reduction in type-size of this order in school textbooks.

A visual appreciation of the loss in visibility resulting from various amounts of astigmatism, expressed in equivalent type-size, may be facilitated by an examination of the following typographical samples.

This is 6-point Old Style No. 1 type. A point is a common measure of type-size. It is equal to 1/72 inch or 1/12 pica.

This is 8-point Old Style No. 1 type. Since 8-point type is widely used, it was selected as a standard in calibrating the Luckiesh-Moss Visibility Meter. It is *not* a recommended size of type for extensive reading materials.

This is 10-point Old Style No. 1 type. Many research viewpoints indicate that types smaller than 10 point should not be used in textbooks.

This is 12-point Old Style No. 1 type. Type of this size is desirable from the viewpoints of visibility and ease in reading.

Similar measurements made with cylindrical lenses placed at axis 180° indicated substantially smaller reductions in visibility. This result is in harmony with optical considerations. For example, the spaces between letters of a given line of print are generally much smaller than the spaces or leading between successive lines of print. Thus a given cylindrical lens at axis 90° would confuse the retinal image of a line of print more than would the same amount of power placed at axis 180°. However, the difference in the visibility of printed matter due to cylindrical lenses placed at 90° and 180°, respectively, would probably diminish significantly as the leading or interlinear spacing is decreased. Obviously, close-set type (without leading) would be most adversely affected by uncorrected astigmatic errors.

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A STATISTICAL ANALYSIS OF CLINICAL TRACHOMA*

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While it is true that the different manifestations, complications, and sequelae of trachoma are well recognized and adequately described in a number of texts, it is likewise true that statistics on the various clinical phases of the disease are incomplete or even unavailable. It was consequently felt that a useful purpose might be served, if, in this connection, a detailed analysis were made of a series of cases large enough to carry statistical validity. Towards this end, therefore, a survey has been undertaken on 1,000 patients recorded in the writers' files. In order to obtain what may be considered a representative sampling of cases, the following procedure was adopted. Approximately half the patients studied were taken from the records in their chronological order of examination or treatment; the remainder were selected alphabetically, irrespective of the dates of observation. In choosing the latter number, the allotment of patients listed under each letter was arrived at by fixing a quota proportional to the names in that particular group. The method of sampling, therefore, is regarded as a reasonably equable distribution of the different concomitants of trachoma.

TABLE 1

DISTRIBUTION OF TYPES AND THEIR RELATION TO TREATMENT PRECEDING EXAMINATION

Types of Infection	Number of Patients				
	Examined	With previous treatment		Without previous treatment	
		no.	percent	no.	percent
I	146	15	10.3	131	89.7
II	364*	120	32.9	244	67.1
III	326	209	64.1	117	35.9
IV	164	104	63.4	60	36.6
Totals	1,000	448	44.8	552	55.2

* Three of these patients were concurrently infected with Gonococcus, and in three others vernal catarrh was also present.

That the data assembled in this way might be rendered most readily assimilable and presentable, they have been arranged in the form of tables containing more or less interdigitating information. Some of the data have been represented graphically as well to allow better visualization. It is proposed to report the results of the analysis under the topics arbitrarily selected for their expediency in discussion.

DISTRIBUTION OF TYPES OF CLINICAL TRACHOMA

The patients have been preliminarily partitioned into types I, II, III, or IV, employing for the purpose the classification advocated by MacCallan. Type II has not been separated further into *a* (follicular hypertrophy) and *b* (papillary hypertrophy), since too often the simultaneous appearance of both forms of conjunctival response in the same individual leaves the differentiation somewhat indecisive. An examination of the data arranged in table 1 reveals that 146 or about 15 percent of the patients studied were classified as having early trachoma, the smallest number, in fact, of the four types. This is probably explainable on the basis that during the incipient stage the symptoms and discomforts are for the most part negligible.

* From the Department of Ophthalmology, Washington University School of Medicine, and Missouri Trachoma Hospital. Conducted under a grant (to L. A. J.) from the Commonwealth Fund, New York, New York.

Consequently, few of the patients are aware of the insidious and serious infection taking place and, therefore, the group as a whole rarely seeks medical advice. Indeed, the majority of these patients were detected fortuitously during routine inspection for prevention and control of trachoma in different communities. Type II shows a sharp rise in incidence to 364 patients, or about 36 percent of the total, and in this respect it runs a close parallel to type III. Here, the number reached 326, or about 33 percent. Type IV suffers a sharp drop, approximating the figure of type I; namely, 164 individuals, or about 16 percent. This observation is readily understandable, since it represents the healed stage of disease, and the majority of these patients seek medical attention not because of the infectious process, but, as will be seen below, because of the serious complications and permanent alterations resulting from the disease. In summary, then, about one third of the total number of cases studied was due to types I and IV, both contributing in approximately equal proportions; and similarly, types II and III participate almost equally to form the remaining two thirds.

It may be of interest to point out that this series of patients was remarkably free of at least heavy secondary infection. The outstanding exceptions were three patients in the type-II group, in whom gonococcal infection was superimposed on the trachoma. In addition, the disease in three other patients of the same type was further complicated by the presence of vernal catarrh, which, while not an infection, is a separate clinical entity. The presence of severe secondary bacterial invasion, however, is comparatively uncommon in the variety of trachoma occurring among the native whites of the Ozark region which furnished the bulk of the patients for this study.

TABLE 2

RELATION OF STAGE OF INFECTION TO REPEATED TREATMENTS IN 500 PATIENTS

Type of Infection	Total Patients	Number of Patients Listed under Number of Treatments										
		1	2	3	4	5	6	7	8	9	10	<10
I	60	54	6	—	—	—	—	—	—	—	—	—
II	190	132	46	10	—	2	—	—	—	—	—	—
III	177	85	45	18	11	7	3	3	1	—	1	3*
IV	73	30	21	8	9	4	1	—	—	—	—	—
Totals	500	301	118	36	20	13	4	3	1	—	1	3

* Of this group, one patient received 12, one 13, and one 16 treatments.

DISTRIBUTION OF PATIENTS WITH AND WITHOUT PREVIOUS TREATMENT

The summarized figures for the series of patients who either had or had not had treatment prior to examination indicate not too divergent a separation. Thus, 448 (about 45 percent) had not been treated previously while 552 (about 55 percent) had had medical care. A break-down of the summaries (see table 1) based on type of infection, however, discloses an interesting progression with successive stages of trachoma. In type I, for example, 15 (about 10 percent) only had felt the necessity of treatment, while 131 (90 percent) had been troubled so little that medical attention was not sought, thus emphasizing again the observation already mentioned, that most of this group were discovered by way of routine examination during field clinics, and not because of ocular discomfort. In type II 120 (about 33 percent) had been treated,

while 244 (about 67 percent) had been without therapy. The rate of those receiving care in type III was double that encountered in type II by reaching approximately 209 (64 percent), with those untreated correspondingly decreasing to 117 (about 36 percent). In type IV, there was little change from the proportions observed in type III: 104 (about 63 percent) had received treatment, while 60 (about 37 percent) had not. Thus, the statistics for preceding treatment indicate again the mildness of type-I infection and the gradually increasing severity from then on to the terminal stage.

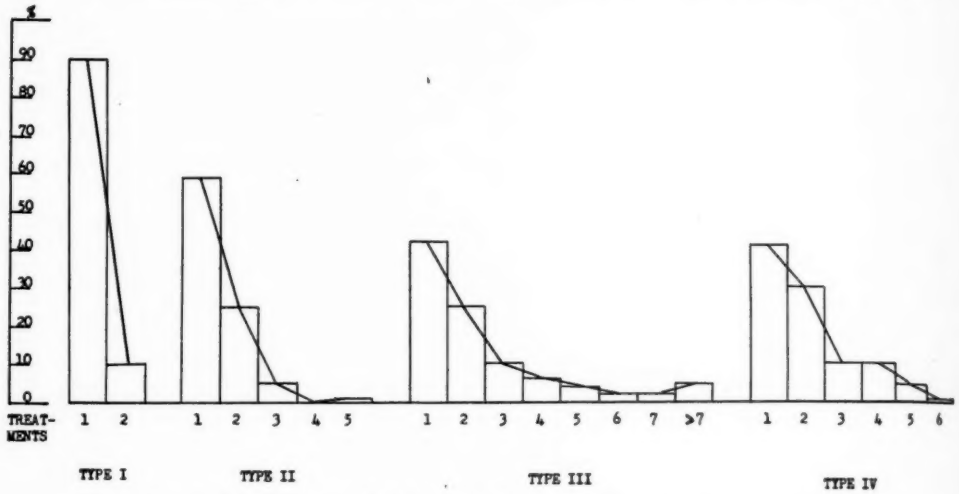

Chart 1 (Julianelle and Smith). Relation of types to repeated treatments.

What is not disclosed by data is the relatively large number of patients requiring repeated courses of treatment following complete, clinical recession of symptoms of disease. It is well known, of course, that trachoma is extremely difficult to cure, so that the conservative and experienced observer regards the infection at such times as arrested, rather than cured. The high incidence of recurrences at varying intervals subsequent to apparent recovery renders any other opinion hazardous, if not unwarranted. That this statement is indeed justifiable is borne out by the data appended in table 2, and, more graphically, in chart 1. Thus, selecting 500 of the patients at random to illustrate the number of treatments each individual had received up to the time of the last inspection, an interesting correlation becomes immediately apparent with the stage of infection. In type I, for example, 6 of 60 subjects (about 10 percent) returned for treatment because of recurrent trachoma. In type II, 46 of 190 patients (about 24 percent) required a second hospitalization, 10 (or 5 percent) a third, and 2 even a fifth. In type III, 45 of 177 cases recorded (about 25 percent) suffered a second attack, 18 (about 10 percent) a third, 11 (about 6 percent) a fourth, and 7 (about 4 percent) a fifth; then, there was a scattering of additional recurrences with 3 patients each reinfected 6 and 7 times, and 1 patient each for 8, 10, 12, 13, and 16 times. This group illustrates the exacerbative nature of trachoma best of all, obviously because in this stage the process is most severe, and, in general, the disease is of longest duration. Finally, in type IV, repeated courses of treatment were needed by 43 of 73 patients as follows: 21 subjects (about

29 percent) twice, 8 subjects (about 10 percent) thrice, 9 subjects (about 12 percent) four times, 4 patients (about 5 percent) five times, and 1 patient six times. There can be no doubt, therefore, that with the succession in types, recurrent disease becomes a progressive factor. In summary, then, it is seen that of the 500 individuals reported, 118 (about 24 percent) experienced second infection, 36 (about 7 percent) a third, 20 (about 4 percent) a fourth, 13 (about 3 percent) a fifth, and then in smaller numbers up to 16 infections. Such figures effectually corroborate the prevailing concept that trachoma does not induce a state of immunity of importance or consequence.

The source of infection in trachoma

That trachoma is accepted throughout this country as a rural disease, and more particularly as familial, requires no particular explanation or discussion. Yet actual figures in this connection are difficult to obtain; at least, in published documents. For this reason, the case records were analyzed with the purpose of obtaining tangible, quantitative evidence from this point of view. The data accordingly collected (in table 3) possess a certain interest. Thus, of the 1,000 patients studied, the origin of infection was obscure in 387, or about one third of the group. Consequently, in order to avoid statistical inaccuracy by speculating on the possible source, these have been classified as undetermined. In the remaining 613 patients, the source of infection was definitely traced to the family in 368 patients (60

TABLE 3

THE FAMILY AS A SOURCE OF INFECTION IN TRACHOMA

Type of Infection	Number of Patients with Source			Rate of Familial to Non-familial percent
	Undetermined	Familial	Non-familial	
I	71	50	25	67
II	166	121	77	61
III	131	116	79	59
IV	19	81	64	56
Totals	387	368	245	60

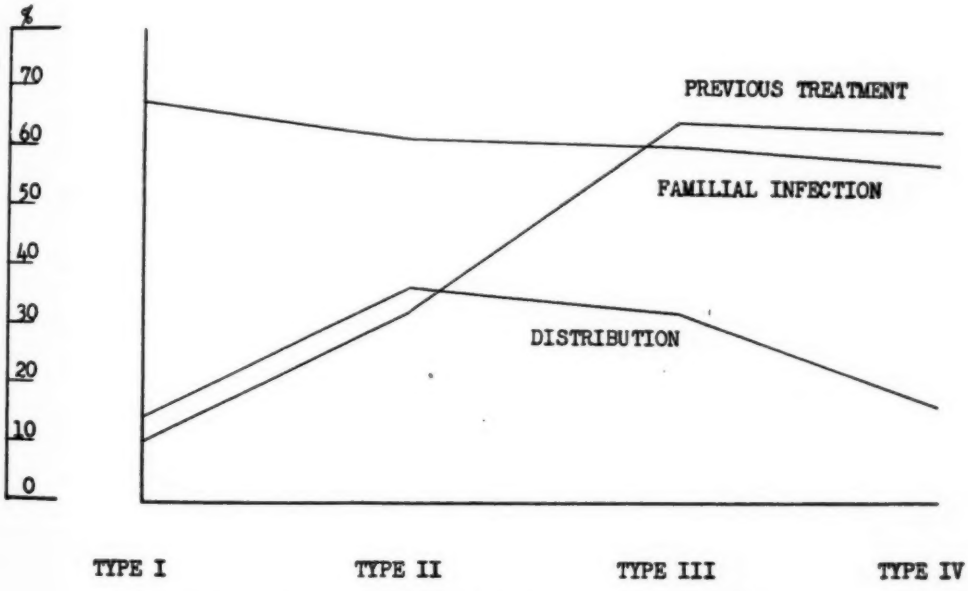

Chart 2 (Julianelle and Smith). Distribution of types; their relation to familial infection and previous treatment.

percent) which indicates the crying need for an effective and persistent educational program. The evidence in these cases was considered irrefutable, since not only the hospital records disclosed members of the family who had been under treatment preceding examination of the individual in question, but clinical inspection of the families indicated trachoma was still present among different members. It may be

TABLE 4

FREQUENCY AND CHARACTER OF PANNUS IN TRACHOMA

Type of Infection	Degree of Pannus (number of patients)							
	Absent		Slight		Moderate		Severe	
	no.	per-cent	no.	per-cent	no.	per-cent	no.	per-cent
I	55	37	70	48	20	14	1	1
II	0		59	16	188	52	117	32
III	0		10	3	68	21	248	76
IV	0		4	2	32	20	128	78
Totals	55	5.5	143	14.3	308	30.8	494	49.4

interesting to add at this point that records available in the Missouri Trachoma Hospital reveal the disease running in families over several generations, and in some instances they prove beyond reasonable doubt that trachoma was prevalent in the same family antedating their migration into this State, particularly from Tennessee. Past experience of one of the writers (J. E. S.) includes knowledge of a number of patients in that State suffering from trachoma, and related to the families now resident in Missouri. In the remaining 245 patients (40 percent) no evidence could be obtained of familial transmission of the disease. A large number of the latter cases were examples of cross infection among school children. Reëxamination of the data in relation to types reveals remarkably close agreement for all stages of the disease. In other words, origin of infection appears to be one of the few factors in trachoma unassociated with the type of infection.

FREQUENCY AND CHARACTER OF PANNUS

A cardinal criterion in the clinical diagnosis of trachoma is the eventual involvement of the cornea in the form of pannus. This development is so characteristic that authorities agree on the danger of making a positive diagnosis in its absence. Nevertheless, it is obvious that there must be a period during early trachoma when the cornea has yet to be invaded. In fact, the records summarized in table 4 actually prove this to be so. Of the 146 patients classified as type I, 55, or 37 percent, presented no sign whatsoever of corneal infiltration and vascularization. In these instances, the diagnosis was still made with assurance because of four factors, contributing singly or jointly to the general picture. Thus, confirmation was attained by future progress of the condition, presence of trachoma in certain members of the family, occurrence of inclusion bodies in stained preparations from the conjunctiva, and, finally, transmission of experimental trachoma to monkeys following inoculation of conjunctival scrapings. For the most part, the patients without pannus were discovered by chance during routine examinations in the field. As might be anticipated, pannus was always present in the other types.

In order to convey concretely the character or severity of pannus encountered among the different types, an arbitrary classification as slight, moderate, or severe involvement was adopted. In a loose, general way, the expression slight signifies little infiltration with capillaries up to 2 or 3 mm. beyond the sclerocorneal limbus, occurring usually in a short segment of the cornea. Moderate pannus indicates grossly obvious infiltration with vessels reaching from 3 to 6 mm. into the cornea, and the segment affected includes almost half the cornea. Severe pannus implies marked turbidity of the cornea, large branching vessels which more fre-

quently than not originate from the entire circumference. As a preliminary statement, it may be said that pannus appeared earlier than is generally realized. It is estimated that within a month following infection, 90 percent to 95 percent of patients already exhibit obvious pannus.

As was anticipated, pannus was least severe in type I. Thus, 48 percent had only slight pannus, 14 percent moderate, and only 1 patient, less than 1 percent, had severe pannus. This exceptional instance undoubtedly belongs to the category of unusual cases that subsequently present essentially corneal trachoma, with little extension into the conjunctiva. With each succeeding type, the character of the pannus progresses towards the more severe variety. In type II, 16 percent were classified as light, 52 percent as moderate, and 32 percent as severe. As in the case of previous treatment the figures for types III and IV run almost parallel. The respective rates for the two stages reveal 3 percent and 2 percent for slight pannus, 21 percent and 20 percent for moderate, and finally 76 percent and 78 percent for severe.

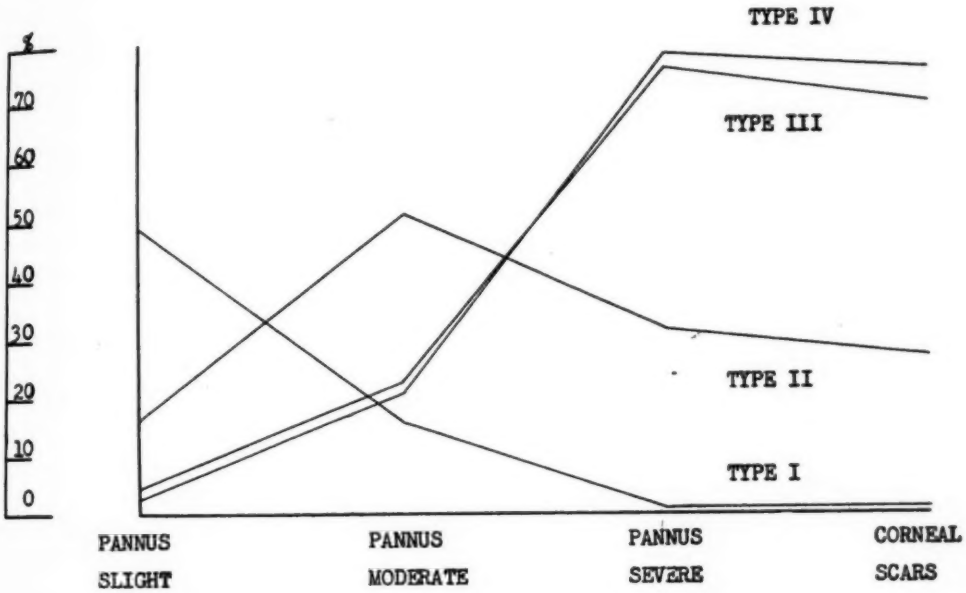

Chart 3 (Julianelle and Smith). Corneal changes in the four types.

Frequency of commoner complications of trachoma

As is obvious to the experienced observer, a number of conditions are seen from time to time as accompanying, if not dependent upon, trachoma. Yet many of these are unusual or sufficiently uncommon in occurrence as to be statistically negligible or even clinically atypical. Such conditions include iritis, ptosis, pterygium, dacryocystitis, ectropion, constriction of the canthi, and involvement of preauricular glands. Consequently, no successful attempt has been made in this study to compile a list of such rare complications, since their incidence has been too infrequent to possess statistical value. Thus, by way of illustration, two patients had severe ectropion, so that surgical correction was necessitated, and six patients required restoration of the canthus. It is

obvious that figures of such low magnitude must be regarded as inaccurate and misleading. On the other hand, certain other complications are of more or less uniform regularity, so that they are correctly envisioned as actual parts or phases of trachoma. These conditions are accordingly summarized in table 5.

A. Corneal scars. Perhaps the most frequent development of trachoma is to be seen in corneal scars. A word may be said on the importance of distinguishing true corneal scars from the diffuse, granular opacities encountered in the lens. Occurring in 15 percent to 20 percent of the patients in the later stages of infection, they give the appearance of sprinkled cornmeal in the lenticular area and may be mistaken for corneal scars. While their origin remains obscure, it is the writers' belief that scars are the direct result of the destructive effect of the virus on the corneal epithelium, just as cicatrization of the lids represents its action on the conjunctiva. How much secondary infection contributes to the scarring is difficult to estimate, although it is well realized that secondary infection by the same organisms in other chronic conjunctivitides does not usually lead to scarring. In any case, the statistics on trachoma reported herein show that corneal scars are expressions of the severity and duration of the infection. In type I, for example, only 2 patients (about 1 percent) gave evidence of scars; in type II there were 100 patients (27 percent); and in type III, 226 patients, or 70 percent, had scars. The figure for type IV rose slightly but definitely to 76 percent. In other words, if the disease progresses to the final stage there is an accompanying, gradual rise from almost zero to a point where three of every four patients manifest corneal scars.

B. Corneal ulcers. By impression, corneal ulceration appears to be much more common than it actually is, possibly both because of its effect on vision and its frequent resistance to therapy. As is commonly appreciated, corneal ulcers may not only themselves be exceedingly difficult to treat but they may also be particularly disposed to secondary bacterial infection which frequently enough presents as great a therapeutic problem as the ulcer itself. A review of the data in table 5 indicates that corneal ulceration in type I must be a rare phenomenon, since not a single instance was found in the 146 cases analyzed. In type II there were 31 patients (9 percent) with ulcers, and oddly enough the same proportion was discovered in type IV, where 14 of 164 individuals were so affected. Type III showed the greatest incidence, with 50 patients, or 15 percent. The progressive increase from type to type, characteristic of a number of manifestations in trachoma, apparently does not obtain in this instance. It is suggestive that corneal ulceration is an accidental occurrence, perhaps not so much dependent upon the virus of trachoma as upon certain exogenous factors. Similarly, the occurrence of ulcers in type IV presents an interesting analogue. If, for example, type IV represents the healed or arrested stage of trachoma, as is commonly believed, then it becomes difficult to understand how ulcers can start in the absence of the virus, or, at best, in the presence of inactive virus. It would seem, therefore, that some other factor aided perhaps by the opportunistic bacteria present, support to a measure, at least, the initiation of ulcers. As illustrative of such an example may be cited the corneal follicle. With denudation or umbilication of the follicle, the localized corneal tissue not only may necrotize, but it may even allow penetration of bacteria through the now disrupted tissue barrier.

Another point of interest is the more or less generally accepted concept that ul-

ceration is responsible for the subsequent scars, so frequently observed in the cornea. It is, perhaps, more likely that while some scars obviously succeed ulcers, others must be dependent upon different causes. Thus, the rate of incidence for ulcers in the entire group was about 1 in 20 patients, while that for scars was approximately 1 in 2. The discrepancy between the two rates is so great as to create a reasonable doubt that scars necessarily imply previous ulcers. Indeed, scars are sometimes seen distributed so diffusely and so thickly throughout the cornea as to give the tissue a frosted or steamy appearance, obviously a process in no way connected with ulcers. Undoubtedly, there are times when ulcers are promoted by the roughness of the lids and its continually irritating action on the cornea.

C. Entropion. The formation of scar tissue to a point which causes inversion of the lids is a result of trachoma too common to require explanation. Entropion occurs in varying degrees of inversion and, for the most part, is too slight to require operation. On the other hand, the condition may become exaggerated, and for relief it must receive surgical attention. In making this report, only the surgical cases have been considered. The evidence in table 5 reveals that entropion is a function of duration and severity of infection and, therefore, of type; consequently, the severe condition is seen in patients of all ages from childhood to senescence. Thus, this manifestation was not encountered in type I, while in type II it only began to make an appearance, running a frequency of less than 1 percent. In type III, there was a moderate rise to 7 percent, while in type IV entropion reached a high peak of over 50 percent, or more than half the patients in this stage. Since entropion is a result of trachoma, it is perhaps natural that the terminal stage should exhibit the greatest frequency of this complication. It may be of interest to add that, first, entropion is not specific of trachoma, but it may and does accompany any chronic inflammation of the lids; and, second, that in its severe form, it is most commonly encountered in untreated and poorly treated cases. Thus, its prevention may often be effected by frequent eversion of the lids with the help, if necessary, of a glass rod. In explanation of its causation, the writers suggest that in a certain number of cases the formation of miliary abscesses in the cartilage of the lid brings about a buckling and then inversion of the tissue. This; more than scar tissue, accounts for entropion. It perhaps goes without saying that the large majority of patients with entropion are also sufferers from trichiasis, at least those who have not already depilated their lashes.

TABLE 5

FREQUENCY OF COMMONER COMPLICATIONS OF TRACHOMA

Type of Infection	Corneal				Entropion		Total Blindness	
	Scars		Ulcers					
	no.	percent	no.	percent	no.	percent	no.	percent
I	2	1	0		0		0	
II	100	27	31	9	3	0.8	0	
III	226	70	50	15	24	7	1	
IV	125	76	14	9	91	56	9	
Totals	453	45	95	10	118	12	10	1

D. Total blindness. Trachoma is perhaps most popularly known for its devastating effect in inducing blindness. While the rates from different parts of the world vary considerably, and the statistics are often inaccurate because of the synchronous activity of equally destructive bacteria (for example, the gonococcus), the impression is perhaps justified that *complete* blindness is not so frequent as the reputation of trachoma leads one to believe. This impression is well brought out by the present survey. It is desirable to point out that the figures in this study

do not attempt to show what proportion of total blindness is due to trachoma, but rather in what proportion of patients suffering from trachoma there is ultimately complete loss of vision. With no blindness occurring in types I or II, there were a single instance in type III, and 9 in type IV, thus making a total of 10 for the entire series; that is, 1 percent of the whole series. It must be remembered, however, that the 1 percent represents only those patients who were completely or totally blind. It is obvious from the foregoing analysis on corneal scars that a large proportion of the patients studied (453 of 1,000) suffered varying degrees of permanent loss of vision. Corneal scars automatically connote, first, a distortion of corneal corpuscles which, in turn, interferes with refraction and transmission of light; and second, they mean replacement of transparent corneal tissue by opaque fibrous tissue. To the limit of their extent, therefore, vision undergoes varying impairment. In a number of instances, the loss of vision is great enough to prevent profitable employment, so that while the patients are not, strictly speaking, blind, they are nevertheless industrially so. The conclusion is obvious, therefore, that while trachoma results in total blindness in a relatively small percentage of individuals, the disease is, nevertheless, responsible for varying degrees of visual loss in almost half the patients, despite active treatment in a corresponding number. In this limited sense, then, trachoma is justifiably characterized as a sight-destroying infection.

Summary

A statistical analysis has been made of 1,000 patients with trachoma, and the more common conditions and expressions of the infection are reported upon. The more significant observations have been:

1. The distribution of patients by types, was: Type I, 146 patients; type II, 364; type III, 326; and type IV, 164.

2. Of this series, 448 had received previous treatment, while 552 had not. Of further interest are the figures indicating that with succession in type, the more frequent the need for repeated courses of treatment.

3. The source of infection was not determinable in 387 cases; in 368 or 60 percent of the remainder, the disease was contracted by way of the family.

4. Pannus was not present in 37 percent of the patients in type I; in the others pannus was increasingly severe with the successive types.

5. Corneal scars occurred in 45 percent of all patients, with types III and IV most heavily affected (about three fourths).

6. Corneal ulcers were encountered in 10 percent of the total patients, and apparently the stage of infection is not a determinate factor in their appearance.

7. Entropion of sufficient severity to require surgical correction was present in 12 percent of this group with more than half the patients of type IV so affected.

8. Only 1 percent of the patients in this series were totally blind. This rate, however, does not include the so-called industrially blind nor those with varying degrees of incomplete blindness.

A CASE OF BOWEN'S DISEASE OF THE CORNEA*

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In 1912 Bowen[1] first described a new pathologic entity that has subsequently borne his name. This atypical, intraepithelial epithelioma was originally reported as occurring on the skin. He[2] later added another case and stated that there was a marked histologic similarity between these tumors and Padget's disease of the nipple.

Darier[3, 4] was the first to confirm Bowen's findings. One of his patients died, showing, at autopsy, metastatic lesions histologically similar to the original facial lesion, thus further confirming Bowen's suspicion of the precancerous nature of the disease.

Jessner[5] in 1921 reported the first case of Bowen's disease occurring on the mucous membrane. Since then many case reports[6–11] and considerable discussion of the subject[6–8, 10–13] have been added to the literature.

In general, it may be stated that Bowen's disease is an intraepithelial epithelioma that may occur on skin or mucous membrane and which may be clinically suspected but must be proved in specimens taken for biopsy or section. It occurs with equal frequency in the two sexes, and whereas more prone to occur in the elderly, a case has been reported in a woman of 25.[9] The lesions give few symptoms, those present depending mainly on the position of the growth. It is a disease frequently of extreme chronicity, some cases showing little or no local spread for 30 years. However, it is also a disease that may at any time spread malignantly either by direct extension, or through the lymphatics, or, as in some melanomas, to a distant point, without giving evidence of local invasion. Contrary to Darier's finding, Bowen's tumor, today, is thought to metastasize as a basal- or squamous-cell epithelioma or as a mixture of these two.

The pathologic picture is typical. There is usually an abrupt change from normal epithelium to tumor tissue. The mass of the tumor is made up of proliferated prickle cells that show certain dyskeratotic changes. The dividing cells are disorderly in size, shape, arrangement, and staining qualities. Mitoses are usually numerous and disordered polarity is frequent. Vacuolization of the cytoplasm, sometimes complete, and intracellular edema are common. Akaryokinetic cell division frequently results in large multinucleated cells or the "clumped cells" of Bowen. Other nuclei vary in size from small shrunken ones with broken-up chromatin material to the very large ones of the so-called "giant cells." Some sections show no superficial cornification while others show it more markedly. In this layer there are individual cells having small dark nuclei which instead of becoming cornified undergo an irregular keratinization and are known as the "corps ronds" of Darier.

The mass as a whole is usually not, but may be, papillomatous in morphology. The basement membrane is never invaded unless malignancy has set in. Beneath this membrane there is a vascularized inflammatory layer made up predominantly of plasma cells and lymphocytes.

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There has been much discussion as to the role of the dyskeratosis and as to whether the tumor is truly precancerous or actual cancer *in situ* from its onset. It is today generally held that the dyskeratosis is probably secondary to the proliferation of the rete malpighii. The second controversy appears to be purely one of quibbling over definition.

The concensus of opinion regarding treatment favors complete surgical excision in preference to irradiation although several good results have been reported following X-ray therapy. All authorities caution against too much temporizing or incomplete removal.

In 1932 Weymann[14] reported a case of a diffuse papilloma of the limbus with a pathologic report by E. Butt. In the report the similarity of some aspects of this to Bowen's disease was mentioned but the final opinion was that of papilloma.

McGavic[15] in 1942 was the first to report Bowen's disease of the cornea. Of his five cases, three developed on antecedent injury or inflammation of the cornea, while in two there had been no previous eye trouble. He also stated that the diagnosis could only be suspected clinically. In these cases, the histologic picture was characteristic of other skin or mucous-membrane Bowen lesions. McGavic stressed the importance of complete removal and favored surgical exci-

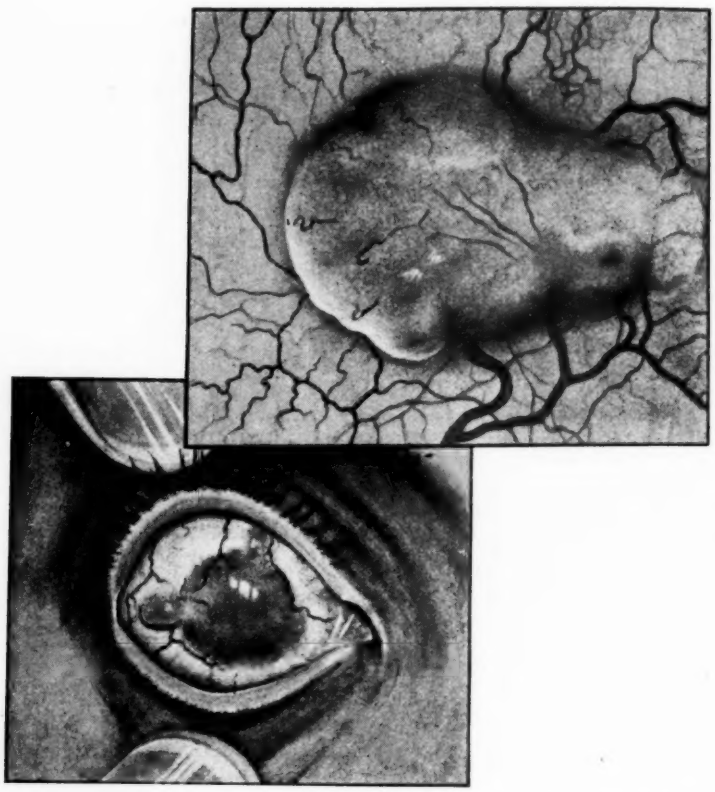

Fig. 1 (Wise). Case of Bowen's disease of the cornea showing the tumor over the entire cornea and the three fleshy papillomatous areas at the 9-, 12-, and 3-o'clock positions. Inset is an enlargement of one of these.

sion, whenever possible, of foci about the eye.

Because of the relative infrequency of this disease in general and its especial rarity as an eye lesion, it was felt that this case warranted reporting.

Case report. J. M., a male Italian, aged 62 years, was first seen in the Vanderbilt Clinic on April 7, 1942, complaining of poor vision in both eyes and of a growth on the right eye. The history revealed that his general health had always been excellent. However, since the age of 17 years, he had had periodic attacks of pain, redness, tearing, and discharge from both eyes. Between attacks the eyes became completely quiet. Following each attack there was further loss of vision. The right eye was more frequently involved than the left. The patient had received treatment over this period at various hospitals in the New York area, although no accurate diagnosis was ever reached.

Three months ago a growth was first noted on the right eye. It was associated with little pain, some redness, no discharge, and decreasing vision.

There was no history to suggest that arsenic had been taken either internally or by injection.

After examination in the Clinic the patient was admitted to the Institute of Ophthalmology on the service of Dr. A. B. Reese.

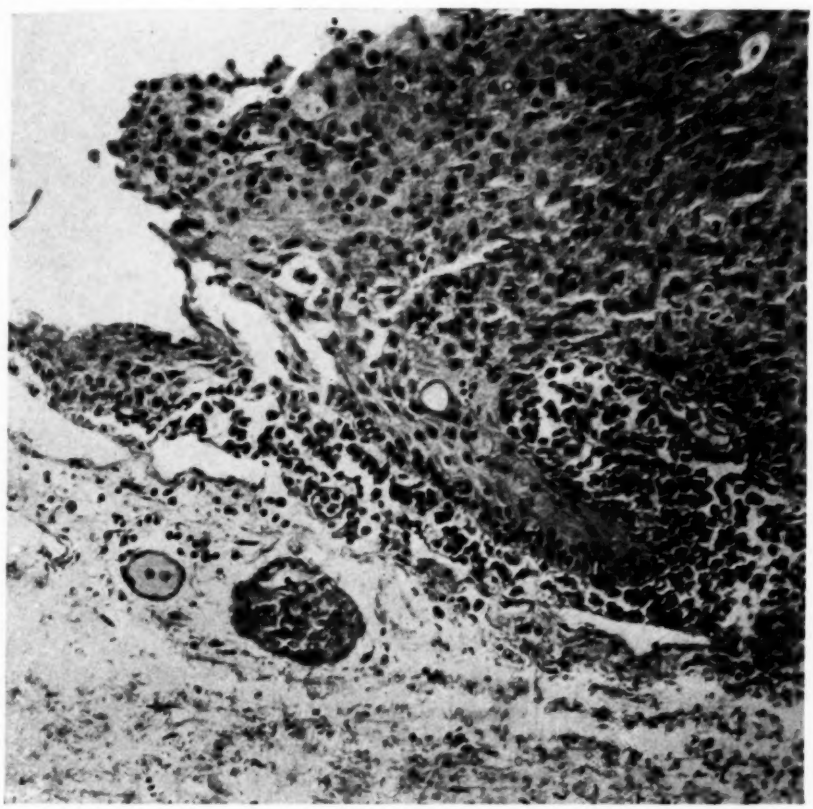

Fig. 2 (Wise). Microscopic section in case of Bowen's disease of the cornea showing the abrupt change from normal epithelium to tumor, the lack of extension beyond the basement membrane, and the inflammatory reaction beneath the tumor.

The general physical examination was negative. No arsenical keratoses of the skin were seen. The eye examination revealed the following condition.

Vision, O.D. light projection (accurate projection); O.S. 7/200.

In the right eye lids and lacrimal apparatus were normal except for several cilia of the lower lid which scratched the cornea. No preauricular nor cervical lymph glands were palpable. There was mild conjunctival hyperemia. Three distinct small fleshy pink masses at the 3-, 12-, and 9-o'clock positions on the limbus could be seen. All masses were freely movable and unattached to the limbus and all were fed by dilated somewhat tortuous vessels. The cornea was covered by an opaque, uneven, thickened tissue connected to each limbal lesion. The corneal sensitivity was reduced. The interior was not seen.

In the left eye lids, lacrimal apparatus, conjunctiva, and regional lymph glands were normal. The cornea showed superficial vascularization coming in one third of the distance from the limbus. The cornea was thinned and scarred throughout its central part and clearer and more normal in its appearance above. The sensitivity was reduced. The anterior chamber, pupil, and iris were normal. The interior was not well seen.

Studies revealed the following facts: Kline test was negative, Frei test negative, B. abortus skin test, agglutinations, and opsonocytophagic index negative, complete blood count negative, blood cholesterol 232 mg. percent and tuberculin 1+ positive to a dilution of 1/10,000.

A clinical diagnosis of epithelioma of the cornea was made, but because of the strong clinical suspicion of this being a Bowen tumor, the type of procedure outlined below was followed.

On April 17, 1942, the tumor was peeled away from the cornea and sclera by a superficial keratectomy. The conjunctiva was undermined and brought up to the limbus to close the defect. The postoperative course was uneventful.

Microscopic report. The corneal surface was covered by an irregularly thickened layer of proliferated epithelium. The superficial cells were cornified in a few places, but this layer was mainly made up of dyskeratotic cells with many "corps ronds" of Darier. The deeper cells, making up most of the tumor, were irregular in size, shape, and staining qualities and had a disorderly arrangement. Some sections showed more active mitosis than others. Several "giant cells" and "clumped cells" of Bowen were seen. Many cells showed vacuolization of the cytoplasm, in some cases complete. Intracellular edema was not a definite feature of this tumor. Beneath the epithelium, Bowman's membrane was absent, being replaced by a layer of vascularized connective tissue containing numerous plasma cells and lymphocytes. The limbal masses (noted clinically) showed papillomatous projections of this tissue up into the epithelium. The basement membrane was at no point invaded. At the periphery the tumor ended abruptly and passed over into entirely normal epithelium. The specimen was diagnosed as a Bowen intraepithelial epithelioma by Drs. John McGavic and A. P. Stout.

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OPHTHALMIC OINTMENTS

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Drugs for local application in ophthalmic practice are intended (1) for use on the skin of the eyelids, especially in relation to that strip of the eyelid that contains the eyelashes, (2) for the lacrimal-drainage apparatus, (3) for the conjunctiva and cornea, (4) for absorption into the anterior portion of the eyeball so as to affect both the anterior and posterior chambers of the eyeball with their bounding structures, especially the iris and the ciliary body. The action of local medication on the more posterior of the structures of the eyeball—that is, on the vitreous, choroid, and retina—is questionable or uncertain, if not nonexistent, so that there is no place, at present, for locally instilled drugs intended to affect these parts.

If spatially limited, momentary application of a drug may be desired—as, for example, during chemical cauterization or silver-nitrate application to a localized area—the best mode of applying such a drug is either in the solid form, as a stick, or on an applicator. If spatially extensive, but not too intensive, yet temporally limited application of the drug is desired, the lotion or drop form of medication is suitable. This may be the case in employing a locally instilled anesthesia, or mydriatic drugs, for diagnostic examinations, or in applying diagnostic stains, or in the treatment of very mild diseased conditions of the anterior segment of the eye.

Most conditions, however, derive the greatest benefit from a more prolonged application of the effective local drug, and for these, the easiest mode of application is in a jelly or in an ointment form. In some inflammations of the lid margins, infections in the lacrimal-drainage passages, conjunctival inflammations, and corneal diseases which can be helped by local medications and inflammation of the iris and ciliary body, the affected tissue can be kept in contact with the drug that it is desired to use locally in an ointment form.

Jellies have been used, but they have certain undesirable qualities. They usually are sticky, so sticky, in fact, that, when placed in the conjunctival sac if they should be pushed into contact with the eyelashes, they will remain glued there, and may not be active at the site where they are needed. Jellies are easily extruded from the conjunctiva; there are, moreover, difficulties from the physical and

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bacteriologic point of view in preserving them. Because of this, jellies are now rarely used. Ointments are much more suitable.

In preparing an ophthalmic ointment, the base selected must be nonirritating, and, if possible, nonallergenic. Petrolatum, largely used as an ointment base, has these properties, but is otherwise not so desired by the ophthalmologists.

Cholesterolated petrolatum (aquaphor) or other water-absorbent petrolatum bases (such as hydrosorb) are more suitable. These bases are very satisfactory from the pharmaceutic point of view, because, being miscible with water up to a certain definite percentage, and yielding a product in any consistency from that of a petrolatum to a semiliquid or liquid emulsion, they can be used to incorporate either water-soluble or water-insoluble drugs in a creamlike ointment. For ophthalmic use, water up to a 40-percent concentration can be incorporated with this base. The more water, in general, the more creamy the salve. The technical procedure of incorporating the water or solution into the ointment base lends itself easily to the extemporaneous preparation of small amounts of ointment when prescribed by the physician. The resulting ointments are both pharmaceutically and aesthetically acceptable.

Nonaqueous ointment bases are advocated for application to dry or to oily skin, but, for application to tear-moistened skin, or to the tear-moistened structures of the eye, conjunctiva, cornea, or to the lacrimal sac, a water-absorptive base that is miscible with water is therapeutically much more effective. Therefore, such a water-absorptive base should make emulsions of the oil-in-water type, with the active drug dissolved in the external-aqueous phase, so that this external phase is in contact with the lacrimal layer covering the ocular structures. Then, this lacrimal layer can easily absorb some of the active drug from the aqueous-external phase of the ointment and have it available for absorption by the ocular tissues themselves. The easily spreading qualities of these ointments is, of course, correlated with a low surface tension.

Unfortunately, the ointment bases that are available to us and that are practical for ordinary pharmaceutic preparations are themselves of the water-in-oil type. These are satisfactory on the skin, but are suboptimal on the tear-wet ocular surfaces. Nevertheless, the ointment bases of the type of aquaphor and hydrosorb are those we must use because of the question of availability and practicality.

The method of preparing an ophthalmic ointment such as is used at the Jewish Hospital in Cincinnati is as follows: For water-soluble drugs, a solution is made in a quantity of water to the amount of at least 20 percent of the ointment. This is placed in a mortar of suitable size, and the remaining water-absorption ointment base is then added in the mortar to equal 100 percent. The solution and the base are triturated thoroughly. As the stirring continues, the ointment base begins to absorb water and, as it does so, it loses its translucency and becomes opaque. When the entire amount of water has become incorporated, the ointment turns white and assumes the consistency of sour cream. Slightly less water makes the resulting ointment less white and somewhat translucent; slightly more water makes it creamier.

Too much water in some mixtures is undesirable, because, upon standing either in the mortar or in the ointment tube, the water separates from the base of the ointment, making it unsatisfactory for clinical use.

When using the term "water" as the vehicle for the solute of the active ingredient, the writer is referring to the

respective buffer solution of that drug, as described in Gifford's "Ocular therapeutics" (1937, edition 2) rather than to distilled water. In other words, the active ingredients such as the chemicals and alkaloids are dissolved in their buffered solution, rather than in distilled water, and this solution is incorporated in the cholesterol base. In this manner, the pH can be somewhat controlled, as it is controlled in collyria. When using a vitamin-containing oil as the active ingredient, the emulsion should be made with normal saline solution rather than with distilled water.

The value of hydrogen-ion control has been recognized in research and industrial work for years past, but it has not been until recent years that notation in the literature has been made of its clinical significance in solutions such as are used in ophthalmology.

In 1929, H. Lipschütz, of Berlin, after many months of experimenting and investigating, announced in a detailed report that the hyper- and hypo-isotonicity of an eye solution was *not* (as heretofore accepted) the most important factor in causing irritation, but that the hyper- and hypo-acidity and hyper- and hypo-alkalinity are of far greater import. This irritation he overcame by dissolving the salt indicated in a buffer solution of that degree (value) of pH which conformed to the pH at which that salt was most soluble and therapeutically active. The buffer action of such a solution also afforded protection against a change of pH when coming in contact with the ocular secretions, thereby preventing precipitation of the basic drug.

In 1931, F. P. Fischer, of the University of Leipzig, reported other interesting and important factors; namely, that, while nine tenths of the amount of the alkaloids used for instillation that is actually absorbed, is absorbed by the cornea, this amount (and consequently the effect produced) is not in proportion to the concentration used, but is markedly affected by the pH of the solution instilled. He also was enabled to effect the optimum reaction of these alkaloids by controlling the pH of their aqueous solutions with buffer salts.

In the following year (1932) Sanford Gifford of the Northwestern University Medical School devoted a chapter of his book, "A hand-book of ocular therapeutics," to this phase of the subject, following it with a long paper (written in collaboration with R. Denton Smith of the Northwestern University Eye Clinic) in February, 1933, in which they emphasized the points enumerated by Lipschütz and Fischer, and augmented them by reports of their experiences and observations in clinical investigation extending over a period of many months. Gifford has also suggested the use of more practical buffer solutions than those originally suggested by Lipschütz and Fischer.

Those first buffers, while protecting the solution from change of pH when coming into contact with ocular secretions and fluids, did not sufficiently protect it against the CO_2 of the air and the fungi and bacteria to which the frequent opening and closing of a bottle of eye solution subjects it. Gifford's Acid Buffer Solution #1 and Alkaline Buffer Solutions #1, #2, #3 do afford this protection, and, with reasonable care, the solutions will remain clear and free from fungi and bacteria for several months.

Suffice it to say, that most chemical compounds partially dissociate into ions (hydrogen and hydroxyl) when placed in aqueous solution, and that by the term "hydrogen-ion concentration" is meant the weight (expressed in grams) of the hydrogen in ionic form present in each 1,000 c.c. of solution. The extent of this dissociation depends upon the nature of

the compound, the nature of the solvent, the temperature, dilution, and so forth, and the predominance of the hydrogen ions over the hydroxyl ions, or, vice versa, determines the acidity or alkalinity (expressed in terms of *intensity,* not volume) of that solution.

Because living cells are influenced by the acidity due to ionic hydrogen and the alkalinity due to ionic hydroxyl rather than by the *total* hydrogen and hydroxyl, the control of that concentration that will insure the optimum reaction is a method of procedure worthy of serious consideration. But, since the dissociated (ionic) hydrogen and hydroxyl comprises only a portion of the total hydrogen and hydroxyl present in a solution, regular titration methods cannot be employed. *Special* methods are necessary to determine its amount, and for this purpose the so-called pH scale was devised. Degrees of acidity and alkalinity are expressed by this scale, but its units are called pH values (not degrees, as in the Fahrenheit temperature scale).

On this scale the pH value 7.0 denotes neutrality—that is, the number of hydrogen (acid) and hydroxyl (alkaline) ions are in exact proportion, as, for example, in pure distilled water. Values higher than 7.0, such as 7.4, 7.6, 8.5, up to 14.0 denote alkalinity, the degree of alkalinity increasing as the numbers increase, each unit being 10 times as alkaline as the one before. Values lower than 7.0, such as 6.5, 6.2, 5.0, 4.5, down to 1.0 denote acidity, the degree of acidity *increasing* as the numbers *decrease,* each unit being 10 times as acid as the preceding higher unit. For example, a solution having a pH value of 9.0 is 10 times as alkaline as one having a pH value of 8.0 (the pH of the tears), and a solution having a pH value of 4.5 is 100 times as acid as one having a pH value of 6.5.

Lipschütz has demonstrated that solutions with a pH value of 9.0 are somewhat painful and irritating; with a pH value of 8.0 (pH of tears) to 7.0, entirely nonirritating. Those with a pH value of 6.6 to 6.3 induce a slight feeling of dryness; with a pH value of 6.0, intense dryness; with a pH value of 4.5, a burning sensation; and with a pH value of 3.4, intense burning. A hyper- or hypotonic solution, if kept at the neutral point, is nonirritating, while an isotonic solution, if decidedly acid or alkaline, is very irritating. Lipschütz also dwelt at length upon the value of the astringent properties of zinc sulphate in the several forms of conjunctivitis, and asserted that these properties are available only when the solution has been properly buffered, meaning, in this instance, protection against the immediate precipitation by the alkalinity of the tears that would nullify the action of the zinc. He states emphatically that it would be an accident if any of the zinc sulphate in an unbuffered solution should escape the action of the tears and exert the desired reaction.

Fischer reported that pilocarpine was best absorbed at pH 4 to 5, and that the optimum reaction of atropine, scopolamine, and eserine was pH 7.5. But, in the latest publication on the subject by Gifford and Smith, written after many months of clinical investigation, it is stated that while the Acid Buffer Solution is suitable for drugs soluble only in acid mediums, such as zinc, phenacaine, cocaine, and epinephrine, the Alkaline Buffer Solution is less irritating, and is a suitable medium for atropine, homatropine, physostigmine and (contrary to previous reports) pilocarpine. They also state that conjunctivitis from physostigmine and pilocarpine probably occurs less often when these are used in alkaline solution, and that the Alkaline Buffer Solu-

tion alone is a nonirritating collyrium, suitable for cleansing the conjunctival sac and for replacing deficient tears.

The aqueous solutions of the alkaloidal and metal salts commonly used in ophthalmology have an acid reaction, and Gifford reports the pH found to be as follows:

Aqueous Solutions

Percent		pH
1	Atropine sulphate	5.8
2	Homatropine hydrobromide	5.5
1	Pilocarpine nitrate	4.8
0.2	Eserine sulphate	6.6
2	Cocaine hydrochloride	4.6
4	Novocaine hydrochloride	4.6
0.2	Zinc chloride in sat. sol. boric acid	4.2
2	Butyn sulphate	5.4
0.9	Sodium chloride	7.0

The advantages of using the buffer solutions above indicated are: (1) the stabilizing of the solution—that is, protecting it from change in pH due to the addition of small amounts of acid or alkali, such as CO_2 from the air and acidity or alkalinity of eye secretions; (2) protection of solutions against fungus and bacterial growth, with the increase in acidity due to that source; (3) the elimination, or, at least, a decided lessening of the occurrence of the conjunctivitis that so often follows the use of unbuffered solutions; (4) the obviation of the initial pain and discomfort to the patient upon instilling some eye solutions.

It is with the miotic solutions (eserine and pilocarpine) that this last advantage is most in evidence. Patients who have been accustomed to using the unbuffered, aqueous solutions of either eserine or pilocarpine have expressed themselves as being most grateful for the buffered solutions.

For preparing ointments of solid drugs insoluble in water, but soluble in the ointment base itself (fat-soluble) or insoluble in the ointment base, it is well to use the drug in a finely divided form, finely levigated, as an impalpable powder. If not available in this form, it is well to powder the solid drug, thoroughly, in the mortar. To the fine powder in the mortar, the water and ointment base are added, and trituration is continued until the powder is thoroughly mixed and incorporated into the water-absorptive base. This is suitable, for example, in making a soft ophthalmic ointment of ammoniated mercury. The desired amount of white precipitate powder is weighed to prepare a 1-percent, 2-percent or 3-percent ointment, placed in the mortar and finely powdered. The water is added first; then the ointment base, and the trituration continued. This makes a very acceptable ointment, acceptable both pharmaceutically and cosmetically for use on the lid margins in certain kinds of marginal inflammation or the infection of the cilia or supercilia, especially in cases of crablouse, phthirius pubis infestation.

In a similar way, a 5-percent ointment of rubrum scarlatium in a water-absorptive, an anesthetic ointment base such as nupercaine or pontocaine, can be prepared where it is felt that the scarlet red will promote epithelization of a corneal

Buffer Vehicles Suggested by Gifford

Alkaline Buffer Solution #1

Acid Buffer Solution #1

Not soluble in either acid or alkaline buffer but in distilled water. 0.5 percent chloretone may be added as a preservative (Gifford)

denudation, and erosion or abrasion. Since these are usually exceedingly painful, the anesthetic ointment forms a better base for this drug. To this may be added about 15 percent to 20 percent of a potent vitamin-A-containing liver oil for its beneficial effect in promoting healing.

The preparation of stronger epinephrine ointment for ophthalmic use has been described by Weintraub of our Jewish Hospital staff in a paper "Strength of epinephrine compounds in ophthalmology —a new epinephrine ointment" (Arch. of Ophth., 1938, v. 19, May, p. 759). In it he described the method of preparing a tenth-normal strength (1.8 percent) and a twentieth-normal strength (0.9 percent) of epinephrine in a creamy, cholesterolated, petrolatum-ointment base prepared from epinephrine bitartrate powder. This is used in the eye for dialating the pupils, to break (alone or with synergetic drugs) recent synechias, and to reduce the congestion and tension in congestive glaucoma. This ointment must be used very cautiously because of great possibilities of damage to the eye.

As was mentioned previously, many mydriatic drugs are intended for only limited local applications, principally to facilitate diagnostic procedures, fundus examinations, or refractions. When these are desired for more prolonged use, as in acute inflammatory conditions of the iris or ciliary body, or to counteract an excessive hypotension of the eye following perforating injuries or operative procedures such as for glaucoma, it is best to use them in ointment form. In the absence of atropine sensitivity, atropine is the drug of choice. Inasmuch as atropine consists of equal parts of dextro-hyoscyamine and laevo-hyoscyamine, and both stereoisomers affect the central nervous system, but since dextro-hyoscyamine is relatively inactive locally in the eye, it is clear that by using a salt of hyoscyamine (laevo-hyoscyamine, formerly official in the U.S.P.), a mydriatic and cycloplegic preparation can be made which will be approximately twice as active in the eye as a preparation of the atropine salt of similar strength, but which will, if systemically absorbed, be only as active as the atropine. Therefore, when a potent mydriatic-cycloplegic is needed for use in the aforementioned conditions, ophthalmologists order hyoscyamine sulfate, water, and water-absorption base prepared in an ointment in preference to the pharmaceutically less elegant and therapeutically less effective commercial atropine-sulfate ointments. This has also been ordered mixed with the scarlet red, vitamin-A, liver-oil anesthetic ointment previously described, in which the combination is desired for the alleviation of corneal disease complicated by serious iritis. This is advantageous in the compounding of extemporaneously prepared ointments because all of the drugs desired can, if compatible, be incorporated in one ointment to simplify the procedure for the patient, who then has one preparation to instil at stated intervals, instead of several separate preparations.

In this connection, it is well to mention that a pharmacy making preparations of potent ophthalmic alkaloids should keep separate utensils for the mydriatic-cycloplegic group of drugs, because sometimes traces of such alkaloids may be found in other preparations due to the porosity of utensils. This can lead to serious results if a trace of hyoscyamine or atropine should get into a preparation intended for a glaucomatous eye.

Such atropine or hyoscyamine ointment is very suitable as a prescription for home use in order to produce cycloplegia in young children for refractive purposes. It is preferable to drops be-

cause it is not so apt to run into the nose and be absorbed systemically, when it produces the flushing so frequently seen in young children. We have been preparing physostigmine salicylate or sulfate ointments of this type for use in the operating room to contract the pupil after certain surgical procedures; for use clinically in acute phases of glaucoma; in refractive work to counteract the previously used mydriatic-cycloplegic if a drop of pilocarpine or physostigmine is ineffectual.

This method of preparation has also been satisfactory in the past for making zinc-sulfate ointment for certain types of conjunctivitis. With the advent of the group of sulfa drugs, there has been less use of zinc sulfate. But the same method of preparation is excellent in making creamy ointments of any desired strength with the soluble sodium salt of the particular sulfa drug wanted. The one we prepare most frequently at present is with the hydrated sodium sulfathiazole in 2, 3, up to 5-percent strength. This preparation is also suitable for injecting into the lacrimal sac when a drug of such type is wanted. It remains there long enough to be effective, especially since it is usually injected where there is some nasolacrimal-duct obstruction.

For use in the various forms of conjunctivitis that are accompanied by secretion and frequent over-night agglutination of the lid edges and lashes, no modality of drug application excels the ointment form, because in addition to the prolongation of the application, the ointment when applied at bedtime also acts as a lubricant on the lid margins and prevents the lid edges from adhering.

Too much emphasis cannot be placed upon the extemporaneous preparation of ophthalmic ointments in general. Sterile technique should be observed. The selected chemicals should be of the highest quality (c. p. quality). The vitamin-containing oils should be of the highest potency, unadulterated, and free from preservatives. If taken from small containers that have previously been sterilized by the manufacturer and used exclusively for ophthalmic ointments, it will not become rancid, for materials or drugs that are sterile or potentially sterile when dispensed in small quantities do not have the tendency potentially to undergo changes that ordinarily would occur if exposed to the external elements of whatsoever nature. No preservatives should be used in ophthalmic ointments because chemical changes take place, forming new unknown compounds and properties.

As has been previously stated, separate mortars and pestles should be used for miotic and mydriatic drugs, rather than ointment tiles. Wooden tongue depressors should be used instead of metal spatulas or hard rubber spatulas. The tongue depressors should be discarded after each preparation. All utensils should be clean and sterile. The ointment should be prepared on a sterile towel. The original container of the cholesterol should be used for ophthalmic practice exclusively, to prevent possible contamination.

After the ingredients have been thoroughly incorporated in the selected ointment base, the technician should examine the ointment under a microscope to be assured of a homogeneous mixture.

Ophthalmic ointments should never be dispensed in jars, nor in any container allowing a large area to be exposed, but in small collapsible tubes.

When the prepared ointment is ready to be placed in a sterilized collapsible tube, it should be placed in the center of a previously sterilized piece of a number-40 parchment powder paper, rolled into a cylinder of a lesser djameter than that of the collapsible tube, and then slipped into the sterile tube. The cap end of the tube

is opened, at this point, and the tube is held by its tip, to prevent crushing. The protruding end of the paper tube is then folded over the metal tube and the ointment is forced into it. The tip is covered when the ointment has forced out the air, and it begins to seep out. When the ointment has been completely forced into the tube, the ends are brought together by flattening the open end, and, with the tube resting upon a firm surface, the flattened edges are held together firmly with the index finger of the left hand while the paper is slowly withdrawn with the other hand, and the tube is ready to be closed. The tube should not be too full as the end should be folded over at least twice in closing. The tube should be labeled with adhesive tape placed near the tip for obvious reasons.

Summary

1. Ophthalmic ointments in general are advantageous for certain types of drug application.

2. Certain types of ophthalmic ointments are best for certain conditions.

3. For ophthalmic use water-absorption bases are superior to other bases.

4. These ointment bases have a low surface tension.

5. Ophthalmic ointments should be buffed.

6. The specific method for preparing several types of ophthalmo-therapeutic ointments is given in detail.

A BRIEF METHOD OF TESTING COLOR VISION WITH PSEUDO-ISOCHROMATIC PLATES*

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In the course of testing the color vision of a large group of male adolescents with the pseudo-isochromatic plates published by the American Optical Company in 1940, we observed that only a small number of individuals gave the correct response to every one of these plates, that a large number of individuals failed with more than 10 percent of the plates, and that a variety of different responses were made to the same plate by apparently normal individuals (these data will be reported elsewhere[1]). A survey of our results from that testing program drew our attention to responses from so many individuals about whose color vision we were in doubt that we decided to make a critical evaluation of these test plates and to attempt to devise a method of using those plates which would produce more uniform and less confusing results. Data obtained in the course of a testing program carried out on four groups of individuals will be reported in detail:[1] these data included the responses made by individuals with apparently normal color vision to each of the plates and indicated the number of individuals failing each of the plates when the manufacturer's method of scoring is used. In the same report a revised method of administering and scoring these plates which yields more uniform and less confusing results was suggested. That method and the data upon which it is based are reported here.

* From the Department of Health, Phillips Academy. This study was aided by a grant from the Carnegie Corporation.

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TABLE 1

THE PLATES SUGGESTED FOR USE IN COLOR-VISION TESTING ARE LISTED, TOGETHER WITH THE CORRECT RESPONSE FOR EACH ONE AND THE USUAL RESPONSE MADE BY INDIVIDUALS WITH DEFICIENT COLOR VISION. WHEN MORE THAN ONE RESPONSE WAS COMMONLY MADE BY COLOR-VISION-DEFICIENT INDIVIDUALS EACH IS GIVEN

Plate Number	Correct Response	Usual Response by Individuals with Deficient Color Vision	Percentage of Color-Vision-Deficient Individuals Making Those Responses
3	56	56	43.4
		No number	20.0
		66	20.0
		86	10.0
		55	3.3
		6	3.3
4	27	27	43.4
		No number	33.3
		26	6.6
		29	6.6
		25	3.3
		28	3.3
		88	3.3
5	8	8	23.4
		3	73.3
		9	3.3
6	6	6	6.6
		5	93.4
9	56	56	33.3
		No number	50.0
		26	6.6
		86	6.6
		0	3.3
15	7	7	83.4
		No number	16.6
16	9	9	83.4
		No number	16.6
19	5	2	100.0
23	56	No number	86.7
		46	10.0
		96	3.3
41	15	15	10.0
		17	86.7
		47	3.3
25*	12	12	100.0
26*	H	H	100.0
46*	Follows line	Follows line	100.0

* Malingerer's test.

METHOD

On the basis of a color-vision-testing program carried out on the 726 male adolescents attending a boarding school, three groups of boys were chosen for further study: (1) 30 individuals (4.1 percent) whose color vision was undoubtedly deficient (none of these boys failed less than 23 of the 46 plates); (2) 5 boys who failed more than 12 and less than 23 of the 46 plates and whose color vision we originally classified as "doubtful"; and (3) a group of 132 boys selected at random from the other 691 boys in the school. In addition to these three groups of boys, a group of 107 boarding-school girls, who had not previously been given this test, was examined: three of these girls were subsequently put into a color-vision-deficient group.

The pseudo-isochromatic plates of the American Optical Company were used. The plates were held 3 feet from the examinee, diffuse daylight of good intensity came from a window behind him, and the plates were read at the rate of approximately one every two seconds. The individual's response was not commented upon and was recorded whenever it differed from the correct one. Three of the 46 plates are for the detection of malingerers; three other plates (35, 36, and 45) required that special directions be given the subject and were omitted in order to save both time and confusion: we have calculated the percentage of plates failed on the basis of 40 plates.

RESULTS

Only 10 percent of our group of 132 apparently normal boys made no errors on the 40 plates and over 20 percent of them failed more than 10 percent of the plates when the manufacturer's method of administering and scoring was used; the girls' record showed even more failures, which may be due to the fact that

TABLE 2

THE NUMBER AND PERCENTAGE OF THE MEMBERS OF EACH GROUP FAILING EACH OF THE 10 PLATES

Plate Number	Normal Boys (132)		Normal Girls (104)		Color-Vision-Deficient Boys (30)		Color-Vision-Deficient Girls (3)		"Doubtful" Color-Vision-Deficient Boys (5)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
3	0	0	0	0	17	56.6	0	0	0	0
4	0	0	0	0	17	56.6	1	33.3	2	40.0
5	0	0	0	0	23	76.7	0	0	0	0
6	0	0	0	0	28	93.4	0	0	3	60.0
9	0	0	0	0	20	66.7	0	0	0	0
15	0	0	0	0	5	16.7	0	0	0	0
16	0	0	0	0	5	16.7	0	0	0	0
19	0	0	0	0	30	100.0	2	66.7	5	100.0
23	0	0	0	0	30	100.0	2	66.7	0	0
41	0	0	0	0	27	90.0	1	33.3	1	20

TABLE 3

A COMPARISON OF THE NUMBER AND PERCENTAGE OF TESTS FAILED BY EACH OF THE BOYS CLASSIFIED AS HAVING DEFICIENT COLOR VISION WHEN THE ORIGINAL AND REVISED METHOD OF ADMINISTERING THE TEST WERE USED

Subject	Plates Failed (40-plate method)		Plates Failed (10-plate method)	
	Number	Percent	Number	Percent
C. G.	23	57.5	5	50
F. P.	24	60.0	4	40
T. H.	24	60.0	6	60
A. B.	25	62.5	5	50
A. M.	26	65.0	5	50
E. G.	26	65.0	5	50
E. R.	27	67.5	5	50
J. K.	27	67.5	6	60
A. W.	30	75.0	5	50
C. D.	31	77.5	6	60
W. P.	31	77.5	6	60
C. S.	32	80.0	8	80
L. C.	32	80.0	7	70
R. L.	32	80.0	6	60
E. M.	32	80.0	8	80
C. K.	33	82.5	7	70
B. E.	33	82.5	8	80
B. D.	33	84.5	8	80
A. H.	33	82.5	8	80
B. H.	33	82.5	8	80
R. S.	33	82.5	6	60
B. P.	33	82.5	8	80
A. R.	33	82.5	7	70
L. B.	34	85.0	8	80
G. D.	34	85.0	8	80
J. A.	34	85.0	7	70
J. F.	35	87.5	8	80
F. H.	35	87.5	8	80
G. M.	35	87.5	8	80
H. L.	36	90.0	8	80

they were less used to this type of test than were the boys. These data and other material presented elsewhere[1] clearly indicate that, if the pseudo-isochromatic plates are used and scored as suggested by the manufacturer, the examiner will have difficulty in determining whether errors made by a large number of his subjects are, or are not, of significance.

In order to simplify and make more uniform the testing procedure we selected plates which we feel should permit an adequate and satisfactory testing of color vision. These particular plates were chosen because: (1) no one of them was

TABLE 4

A COMPARISON OF THE NUMBER AND PERCENTAGE OF PLATES FAILED BY EACH OF THE BOYS CLASSIFIED AS HAVING "DOUBTFUL" COLOR-VISION DEFICIENCY WHEN THE ORIGINAL AND REVISED METHODS OF ADMINISTERING THE TESTS WERE USED

Subject	Plates Failed (40-plate method)		Plates Failed (10-plate method)	
	Number	Percent	Number	Percent
J. L.	12	30.0	1*	10
J. C.	13	32.5	2	20
R. H.	17	42.5	1*	10
H. P.	17	42.5	3	30
W. W.	20	50.0	4	40

* The plate failed was number 19.

failed by any of our normal subjects; (2) no less than four of them were failed by our subjects whose color vision is deficient; (3) all of our boys whose color vision was considered "doubtful" and each of the three girls who had some impairment of color vision failed at least one of them. The plates chosen for the revised test are listed, together with the correct responses, in table 1; three plates for the detection of malingerers are included.

In table 2 are given the number and percentage of the 132 normal boys, 104 normal girls, 30 color-vision-deficient boys, 3 color-vision-deficient girls, and 5 "doubtful" color-vision-deficient boys, failing each of the 10 plates. When only these 10 plates (plus three malingerer's plates) are given, none of the 132 boys or 104 girls having apparently normal color vision failed even one plate. The advantage in interpretation of this method over one in which 20 percent of these subjects fail more than 10 percent of the plates is obvious. At the same time the percentage of plates failed by color-vision-deficient individuals is high. Data in table 3 indicate that the percentage of tests failed by color-deficient individuals differs very little when either the original method (with 40 plates) or when the revised method (with 10 plates) is used. In table 4 a similar comparison of results from the boys classified as "doubtful" is given; it will be seen that the shorter method is capable of selecting these individuals who have a less severe impairment of color vision.

This method, utilizing only 10 plates plus three malingerer's tests, has recently been used by us to test the color vision of 190 other male adolescents representing the entire group at a summer school. Of this group 5.3 percent failed four or more of the 10 plates, and none failed less than four plates.

Summary

A brief method for testing color vision, utilizing the pseudo-isochromatic charts published by the American Optical Company, is suggested. This method requires less time to administer, is attended with much less difficulty in interpreting results, avoids the introduction of eye fatigue as a factor in the individual's response, and yet efficiently detects individuals whose color vision is impaired. It is recommended that 10 of the plates (plus three malingerer's plates) be used, and that the failure of more than one of these tests be considered evidence of color-vision deficiency.

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NOTES, CASES, INSTRUMENTS

CHOROIDEREMIA

THEODORE M. SHAPIRA, M.D., AND
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Chicago

Since Mauthner's original description of choroideremia in 1871, 30 additional reports of this disease have appeared in the literature. Bedell[1] published an exhaustive study and review of the literature in 1938, and Friedman added a single case report in 1940.[2]

Choroideremia is a nonprogressive disease characterized by a bilateral absence of the choroid and accompanied by night blindness and visual-field contraction, but with preservation of central vision, at least until very late in the development of the disease. All but one of the cases reported have been in males. There is a typical fundus picture, since most of the choroid and pigment epithelium is absent. The fundus appears white or greenish-white, with an island of normal red color only in the macular area. Choroidal vessels may be entirely absent or a few small vessels may remain. There are generally a few clumps of scattered pigment. The retinal circulation is usually normal in appearance, with occasionally somewhat narrow arteries. In only a single patient were the vessels described as very narrow. The discs are normal. Friedman's report presents an excellent differential diagnosis from retinitis pigmentosa. The nature of the condition, whether congenital or acquired, has not yet been determined. Bedell believes that it is a dissolution of choroid developing during the life of the patient, and therefore not a congenital absence. There have been no pathologic examinations.

We are reporting the following case of choroideremia not only because of the rarity of the disease but also because of the unusual aspects of this one. First, only once before has choroideremia been described in a female. Second, because of the associated local and general pathology, the ophthalmologic picture was almost overlooked as being one of choroideremia.

A. T., a white woman, aged 52 years, was seen in November, 1941, in the Eye Department of Mandel Clinic, complaining of poor vision. She was quite illiterate and therefore appeared with her husband, who stated she had told him that her vision had been poor since childhood and that for this reason she had never attended school. Her vision always seemed better during the day than at night. There was no family history of poor vision.

Since the patient was known to be a hypertensive (having had a cerebrovascular accident two years previously and giving a history of dyspnea, orthopnea, and leg edema), a controlled diabetic, and luetic, it was decided to hospitalize her for a complete work-up. Significant general findings were confined to the cardiovascular and neurologic systems. Under the former there was evidence of moderate cardiac failure with blood pressure 210/120. She had slurred speech, bilateral Hoffman-Babinski signs, and exhibited spontaneous laughing and crying. The blood Wassermann test was four plus, as was the spinal-fluid Wassermann, which showed a paretic-type gold curve. The blood sugar was normal.

The vision in each eye was confined to the counting of fingers at three feet. The eyes appeared normal externally except for Argyll Robertson type pupils. Slit-lamp examination of the left eye uncovered no abnormal findings other than faint old superficial scarring of the cornea. In the right eye the cornea showed similar scarring, but in addition there were many pigmented deposits on the

posterior surface. The anterior chamber was of moderate depth, a faint aqueous flare and an occasional cell being visible. The iris appeared normal except for posterior synechias between the 7- and 9-o'clock positions. There were patches of iris pigment on the anterior lens capsule. The lens showed a few scattered opacities in the anterior cortex and an early posterior saucer-shaped cataract.

Both fundi presented the same picture. They were greenish-white in color, except for the macular area, where there was an island of pink. There was a complete absence of choroidal vessels. The retinal arteries were thinner than normal and rather straight, with but little branching. Pigment granules were clumped sparsely over the entire fundus. The disc appeared normal in size, outline, and color.

The pupil of the right eye was not dilated enough for fundus photography. The accompanying figure is a photograph of the left fundus.

Visual fields could not be taken because of the uncoöperativeness of the patient.

Obviously many complicating factors enter into the diagnosis of this case. It might be argued that it is a secondary choroidal atrophy on a luetic basis. However, Dr. Robert von der Heydt,[3] who photographed the fundus of the left eye, and who has seen five previous cases of choroideremia, agrees with us in maintaining that the fundi here show the exact picture of choroideremia, and that the other ophthalmologic and general findings are coincidental.

In the light of Verhoeff's[4] caution as to confusing this picture with that of gliosis of the retina, the fundi were reexamined and found as herein described, with no widespread gliosis, as he found in cases of retinitis pigmentosa. Of course, we agree with Verhoeff in his statement that true choroideremia must be demonstrated histologically before it can be established as an existing entity. However, the following significant findings stand out in this case:

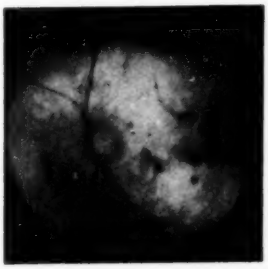

Fig. 1 (Shapira and Sitney). Fundus of the left eye in a case of choroideremia, clinically diagnosed in a woman (photograph by Dr. von der Heydt).

1. This is the second case on record occurring in a female.

2. There was a complete absence of the choroid and its vessels.

3. Vision has always been very poor from childhood on, in contradistinction to the slowly progressive decrease in vision seen in retinitis pigmentosa.

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ANGIOMATOSIS RETINAE*

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Haemangiomatosis retinae is currently regarded, not as an angiomatous malformation, but as a primary vascular new growth of the retina. This clinical entity, first established by von Hippel and given his name, is characterized by familial incidence, is of congenital origin, and associated with vascular tumors or cysts elsewhere in the body. The early retinal picture is distinguished by markedly dilated vessels with peripheral angiomatous formation, progressing to a stage of massive exudation and glial proliferation. The process advances to a final stage of retinal detachment, iridocyclitis, secondary glaucoma, and loss of the eye.

The first description of angiomatosis retinae appeared in the literature in 1879. Von Hippel called attention to the nature of the disease in the first decade of this century. It remained for Lindau, in 1926, to broaden the conception of a purely local vascular disease into a syndrome of angiomatous cystic growths in various parts of the body, especially the cerebellum, retina, kidney, and pancreas.

In the early stage the ophthalmoscopic picture is striking: In one sector of the retina a pair of enormously dilated tortuous vessels extend from the disc to a small spherical red cystic tumor located in the periphery. The two vessels, artery and vein, resemble one another in color, the former being slightly smaller and less tortuous and often presenting sacular dilatation in its course. The second stage of the disease is marked by the appearance of retinal edema, gradual increasing exudation, especially along and between the dilated vessels, hemorrhages, and a reactive gliosis. This stage resembles the retinal picture of Coats's disease or of a proliferating retinitis; the tremendously enlarged blood vessels and vascular tumors, if not masked by the exudation, differentiate the diseases. The process slowly progresses to the final stage—secondary glaucoma, iridocyclitis, detachment of the retina, and destruction of the eye.

The disease is said to be bilateral in 50 percent of the cases. In one of every four cases of von Hippel's disease, angiomatous cysts or tumors occur elsewhere in the body, particularly in the cerebellum. Evidence of cerebellar pathology may manifest itself years after the diagnosis of angiomatosis retinae has been made. A familial incidence has been reported in about 20 percent of the published cases.

Pathologically the retinal tumors are capillary and caverous hemangioblastomas surrounded by gliosis. Grinker[1] regards the tumors as new growths that arise from rests of primordial angioblastic mesoderm. "They are usually tufts and convolutions of capillary size or under capillary spaces lined with active proliferating endothelial cells. Single endothelial lined tubes are frequent. The blood vessels are thickened and surrounding glia proliferated. Degenerated tumor cells filled with fat are common. The connective tissue stroma is moderate in extent." The stage of exudation shows enormous masses of exudation, hemorrhage, and fibrosis lying between the retina and choroid. Large vessels with cystic spaces are seen in the retina together with areas of proliferating glial, endothelial, and fibroblastic cells.

The conception of a primary vascular tumor with secondary glial changes has been disputed. Some observers regard the disease as primarily glial with secondary vascular changes. Clinically the vascular anomalies are clearly predominant. Most

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* Read before the Virginia Society of Ophthalmology and Otolaryngology Staunton, Virginia, May 16, 1942.

authorities agree with the original opinion of Treacher Collins that these angioblastomas are neoplasms of mesoblastic tissue, differing from neoplasms of neuroepiblastic tissue with secondary vascular changes.

Because the syndrome of von Hippel-Lindau is characterized by a hereditary tendency, a congenital origin, and the formation of cysts and tumors in the eyes and various parts of the body, with a predilection for the central nervous system and the retina, it shows marked resemblance to tuberous sclerosis (Bourneville's disease), neurofibromatosis (Von Recklinghausen's disease), and the Sturge-Weber syndrome. Van der Hoeve has given the name of phakomatosis to this group of syndromes. The clinical similarity and the comparable pathologic lesions in various forms link these separate entities amazingly together.

Case report. The patient, a school girl of 13 years, first came to my office on October 13, 1941, complaining of sudden blurring of vision in her left eye. This was found to be due to a retinal hemorrhage in the region of the superior temporal vessels. There was then noted the tremendously dilated retinal vessels in the nasal portion of the right eye and the temporal position of the left eye. In the right eye the vessels could be easily followed to a red cystic mass in the periphery. The left eye showed in addition in between and around the dilated vessels white areas of glial proliferation. The dilated veins were tortuous, coiled, and enormously enlarged, whereas the remaining retinal veins seemed normal in size. The affected arteries showed areas of aneurysmal or fusiform dilatations. It was difficult to differentiate between artery and vein. Externally the eyes were negative, the media clear. There was a field defect corresponding to the lesion in the temporal fundus. General physical and neurologic examination was negative. Vision O.D. 20/20, O.S. 20/30. The patient appeared to be a healthy normal girl in every respect. Her sister believed that the retinal hemorrhage was associated with the starting of her menstrual periods.

The family history is of great interest. Her mother died of an unknown cerebral neoplasm. Her brother died several years ago of a brain lesion, found at operation by Dr. Dandy of the Johns Hopkins Hospital to be a large arteriovenous aneurysm of the cerebellum. On several occasions I had the privilege of examining his fundus. At that time it was thought that the marked dilations of his retinal vessels, choked disc, and proliferating retinosis was secondary to the increased intracranial pressure, although I recall mentioning to a visiting neurosurgeon the possibility of Lindau's disease. With this latter diagnosis Dr. Dandy was not in agreement. Of interest at this time is to mention the opinion of Fuchs, in 1882, who considered the disease an arteriovenous aneurysm of the retina. Possibly in this case the cystic formation was poorly developed in the cerebellum. The cyst is presumed to be caused by a plasma transudate from the vascular tumor.

On advice of Dr. Alan Woods of the Wilmer Institute, who kindly saw the girl in consultation, deep X-ray therapy was instituted at Duke Hospital under the direction of Dr. R. J. Reeves. Starting on January 21st three treatments were given of 500 r units to each eye, 200 K. V., and a 1 mm. copper filter. A lead cup was used over the eye, directing the rays through a very small opening to the lesion.

Through the courtesy of Dr. Jack Guyton of the Wilmer Institute the fundus photographs herewith shown were made available for publication.

Following irradiation therapy no change in the ophthalmoscopic appearance

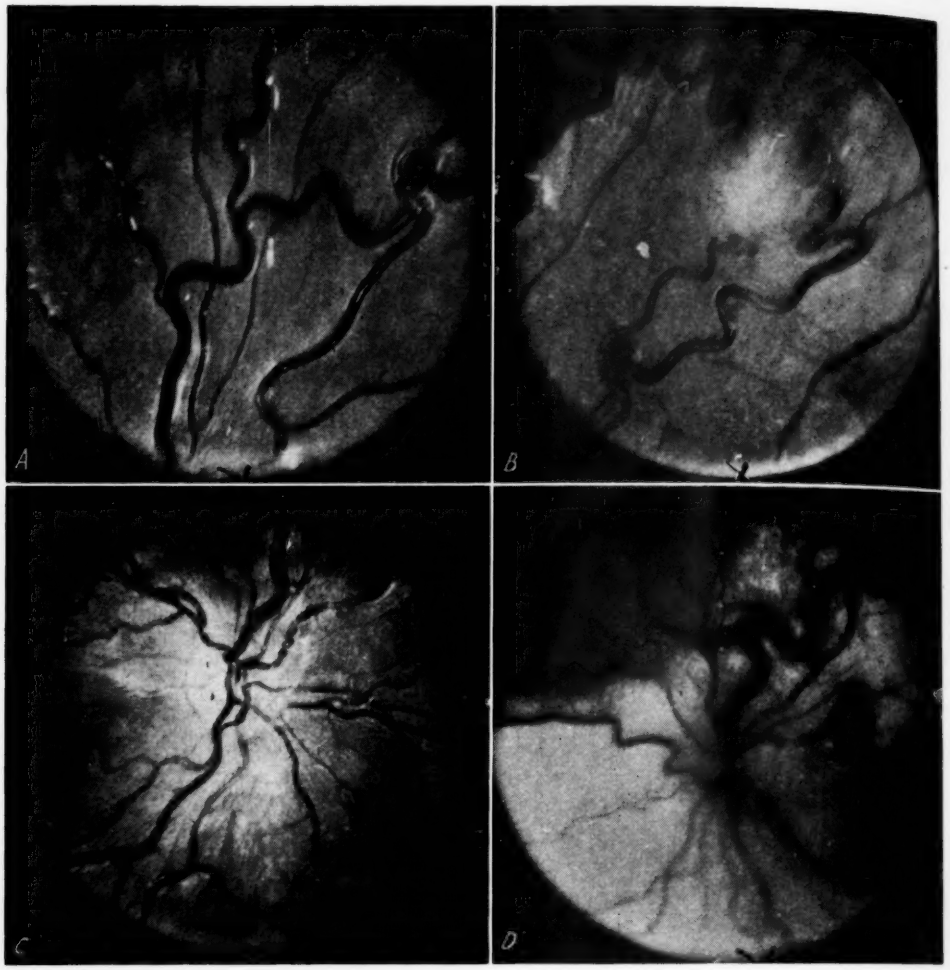

Fig. 1 (McGovern). A, B, C, angiomatosis retinae of the right eye, stage of vascular dilation and angiomatous formation. D, angiomatosis retina of the left eye, stage of exudation and hemorrhage.

of the right eye has been noted and the vision has remained 20/20. There has been a pronounced loss of vision in the left eye. The exudate has greatly increased in amount. The entire inferior portion of the retina below the level of the upper portion of the disc appears as a white opacity. The normal superior portion of the retina is sharply demarcated from the involved area. The subretinal exudate is more extensive in the region of the involved vessels, although there appears to be a perivascular area of clear retina surrounding these vessels.

A survey of the literature reveals the following methods of treatment currently in vogue: deep X-ray therapy, radium and radon seeds, catalysis with surface diathermy, and microdiathermy puncture. Catalysis and surface diathermy are advocated by Kaye to induce an obliterative endarteritis of the dilated vessels, particularly in the solitary type of vascular tumor. Kaye[2] reported two cases successfully treated. He feels that this type of

treatment is more accurately controlled and without the dangers of radium-irradiation cataract and macular exudates. In their case, Cordes and Hagen[3] found, one year after X-ray therapy, a decrease in size of the tumor, the exudate lessened, but the vessels unaltered. They believe that localized radium therapy in cases of early involvement produces a greater effect than roentgen irradiation.

Angiomatosis retinae is a rare but well-recognized entity. As Cordes and Hagen have pointed out interest now lies in therapy rather than diagnosis. The progress of this girl will be watched with interest. Advances in irradiation therapy and neurosurgical skill in the treatment of cerebellar angiomatous cysts make the prognosis more favorable than in the past. I believe the unfavorable result of irradiation therapy as seen at this time would suggest the use of surface diathermy and micropuncture or localized radium therapy to the early lesion in the right eye.

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A NEW CYCLODIALYSIS INSTRUMENT*

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The instrument shown in the accompanying illustration was devised for the purpose of injecting air into the anterior chamber after cyclodialysis.

A no. -20 intravenous needle was bent to conform to the usual cyclodialysis instrument, its end flattened and smoothed off. The needle was then attached to a 2-c.c. hypodermic syringe. At operation, air is drawn into the syringe and cyclodialysis performed in the usual manner. At its completion, air is gently forced into the anterior chamber.

It is the opinion of those who have used this instrument that the immediate filling of the anterior chamber with air definitely lessens the incidence of anterior-chamber hemorrhage.

In addition to its use as our instrument for cyclodialysis, it has been successfully used for air injection in a patient suffering from aniridia and glaucoma, when, following a filtration operation, the lens was displaced forward into the anterior chamber, with resultant return of increased intraocular pressure.

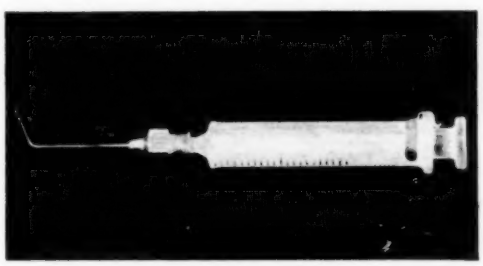

Fig. 1 (Randolph). Instrument for injecting air into the anterior chamber following cyclodialysis.

Due to its curved end, the usual stylette cannot be inserted. Therefore, to prevent clogging, alcohol and ether must be run through the needle immediately after its use.

* From the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital and University.

TREATMENT OF ACUTE OPTIC NEURITIS WITH VASODILATORS

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Although optic neuritis and retrobulbar neuritis are not separate and distinct diseases, the differences being chiefly the matter of location of the inflammatory changes and swelling,[1] papillitis differs in that room for expansion of the inflamed optic nerve is limited by the stiff scleral ring, whereas in retrobulbar neuritis, there is the soft cushion of the retro-orbital fat to give way. The papilla may well be blocked off from its blood supply during the process of inflammation. The resultant permanent loss of vision depends on how great the edema is, and how rapidly the acute inflammation with its edema subsides.

Duggan[2] interprets the pathologic picture in the acute condition to be the result of an arterial spasm with dilatation and increased permeability of the capillaries leading to localized edema and tissue anoxia. The arterial spasm limits the access of oxygen to the capillaries. The capillaries then become more permeable; this is followed by edema and round-cell infiltration.

The essential treatment of optic neuritis should be directed against the cause. But since the cause is obscure in the great majority of cases, this leaves us with only general measures. The older accepted method of treatment included bedrest in severe cases, administration of salicylates, cathartics, hot sweat baths, pilocarpine injections, and so forth. Operative measures, chiefly on the nasal sinuses, were frequently advocated.

The prognosis, according to most textbooks, is good even if no treatment is given. Unfortunately, I have not been able to find a reported series of cases giving the final resultant vision in acute optic neuritis, comparing the results when no treatment is used, or when the general measures mentioned have been used, with those after some definite type of treatment. In his series of cases of retrobulbar neuritis, Duggan[2] reports that a large percentage of untreated patients, and those treated by general measures, did not recover good, useful vision. He concludes that acute retrobulbar neuritis does not have a natural tendency to heal spontaneously, contrary to the good prognosis given in most textbooks.

Bearing in mind the thorough investigation done by Duggan and the good results obtained with the use of vasodilators in treatment of retrobulbar neuritis,[3] I have used vasodilators, supplemented with thiamin chloride, in the treatment of acute optic neuritis. During the past year and a half, in private practice, I have seen and treated with these drugs five consecutive cases of acute optic neuritis. In each case resultant vision of 20/30 or better was obtained. This may be purely coincidental, or there may be some definite value in the use of vasodilators in the treatment of acute optic neuritis.

The dosage of erythrol tetranitrate is prescribed as one-half-gram tablets three times daily for three weeks. This is decreased gradually as the vision improves. Thiamin chloride is prescribed chiefly as an adjunct to the vasodilator drugs. This drug, too, probably acts as a vasodilator rather than by relieving a hypothetical vitamin-B deficiency.[4] The dosage prescribed is 5 mg. three times a day, and it is decreased together with the vasodilator. Atropine drops are prescribed routinely because of the tendency to an associated uveitis. The dosage is judged according to the individual case.

In one case I used nitroscleran 100 mg., intravenously, every other day for six doses; thiamin chloride was prescribed, as was atropine also. No other vasodilator

was administered. Noting no more improvement with this drug than with erythrol tetranitrate, only the six doses were administered. The erythrol tetranitrate was then prescribed by mouth. This is certainly not a fair trial as a test of the comparative value of the two vasodilators. Nor are five cases enough from which to draw any definite conclusion. Only after a large enough series has been treated and comparison made with the other methods can any definite conclusion be drawn.

Case reports

Case 1. B. A., a schoolgirl, aged 17 years, was seen on February 1, 1941, complaining of having had poor vision in her right eye for the past two weeks. There was no pain, nor had she other complaints. The vision, O.D., with correction, was 20/70−1; O.S. 20/20. Examination of the right eye revealed a few dustlike opacities in the vitreous. The optic disc was swollen one diopter in size, had irregular margins, and there was edema of the adjacent retina, without hemorrhages or exudates. Visual-field examination revealed a 3-degree central scotoma for red, 2/1,000. The patient was admitted to the hospital, where careful examination discovered no abnormal clinical or laboratory findings. The patient felt very well. A course of erythrol tetranitrate and thiamin chloride was prescribed; atropine was instilled. On March 15, 1941, the corrected vision was 20/50; on April 10, 1941, it was 20/40. The patient was not seen again until December 2, 1941, when the vision was 20/30. The optic disc showed slight pallor. There remained two pin point areas of scotoma for red within the 3-degree central area.

Case 2. J. H., a housewife, aged 43 years, was first seen on June 16, 1941, complaining of having had poor vision in the left eye for the past week. There had been some soreness in the eye. Vision, without correction, was limited to perception of hand movements, unimproved with lenses; vision, O.D., was 20/20. Examination revealed swelling of the optic-nerve head with edema of the surrounding retina, including the macula. There was a large central scotoma measuring 20 degrees, 3/1,000. The patient was hospitalized. Laboratory findings were normal. Physical examination revealed a mitral heart murmur. Erythrol tetranitrate and thiamin chloride were administered; atropine was instilled. On June 24, 1941, the patient's vision sufficed to count fingers at four feet. On July 7th, vision was 20/50; on July 29th, 20/20−2, 4-point print for near. Visual-field examination, made on that date, revealed no scotoma. The optic disc had a slight pallor, and there was some residual connective tissue.

Case 3. P. C., a stenographer, aged 24 years, was first seen on September 2, 1941, complaining of having had poor vision in her right eye for three days. Vision in the left eye, which was strabismic, had been poor since childhood. Vision, O.D., with correction, was 20/30; O.S., 20/200, unimproved with lenses. There was a left esotropia of 15 prism diopters. Examination revealed some connective tissue on the disc. Visual-field examination uncovered no scotoma. Erythrol tetranitrate was prescribed, on the suspicion that this might be an early optic neuritis. When the patient was seen on September 6th, edema of the disc was readily noted. Vision was 20/40, but the patient stated that objects seemed distorted. She was hospitalized. Erythrol tetranitrate, thiamin chloride, and atropine drops were prescribed. Careful clinical and laboratory examination revealed no abnormalities of significance. On September 26th, the vision was reduced to 20/70. There was a beginning iritis with

some corneal precipitates. The atropine dosage was increased. On October 10, 1941, the corrected vision was 20/40; on October 24th, it was 20/30; and on November 12th, 20/30+3. Visual-field examination revealed a small central scotoma measuring less than one-half degree, for red, 2/1,000. There remained some floating vitreous opacities.

Case 4. B. F., a student, aged 20 years, was first seen on January 24, 1942, when he complained of having had blurred vision in the left eye, for three weeks. Objects appeared distorted when seen with that eye. Vision with correction was 20/70. There was edema of the disc, extending to and involving the macula, so as to give a star-shaped figure in the macula. There were numerous floating opacities in the vitreous. Visual-field examination revealed several central scotomas within 3 degrees, red, 2/1,000. The blind spot was slightly enlarged. Atropine, erythrol tetranitrate, and thiamin chloride were prescribed. On February 7, 1942, the vision was 20/40; on February 21st, it was 20/30. When last seen, on March 28, 1942, the vision was 20/20−2. There was some optic-nerve pallor; the blind spot was normal. The central scotoma remained the same.

Case 5. G. G., a student, aged 15 years, was seen on March 4, 1942, complaining of blurred vision in his right eye. Vision, O.D., was 20/200; O.S., 20/20. The optic disc was swollen one diopter. The edges of the disc were markedly blurred; the veins were dilated. There was some exudate of the disc. Central scotoma for red, 2/1,000, was 5 degrees. The blind spot was moderately enlarged. Laboratory and clinical examination revealed no abnormalities. Nitroscleran 100 mg. was given intravenously. Thiamin chloride and atropine drops were prescribed for the eye. The nitroscleran was administered every other day, for six doses. On March 20, 1942, the vision with correction was 20/70. Erythrol tetranitrate was prescribed to be given by mouth. On April 25th, the vision was 20/40; on May 23d, 20/30+2. Edema of the macula was practically all gone. Slight optic pallor and some connective tissue on the disc remained. There also remained a small scotoma for red, 2/1,000, near the fixation point.

Summary

1. A series of five cases is reported. Treatment was with vasodilator drugs. The resultant vision in each case was 20/30 or better.

2. Further investigation along this line of treatment is encouraged.

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SOCIETY PROCEEDINGS

EDITED BY DR. RALPH H. MILLER

COLORADO OPHTHALMOLOGICAL SOCIETY

May 17, 1941

DR. WILLIAM M. BANE, *presiding*

OLD TRACHOMA TREATED BY SULFANILAMIDE

DR. J. W. THOMPSON presented the case of E. B., aged 20 years, who had been almost blind since his ninth year. Both eyes were operated upon and treated at the U. S. Trachoma Hospital, Rolla, Missouri. His eyes became inflamed at regular intervals. The vision O.D. was 6/200; O.S. 8/200. The lids of both eyes drooped and were thickened. The palpebral conjunctiva of the upper lids showed many scars and thickened tarsal cartilages. The corneas showed marked central opacities, with some pannus, particularly in the left eye. The pupils, which were hazily seen, dilated equally and were round. On February 20, 1941, the patient was admitted to the Hospital and given sulfanilamide, 15 grains, four times daily for two weeks, followed by 10 grains four times daily the third week, and atropine was instilled into the eye. There were no untoward symptoms from sulfanilamide. Urinalysis was negative throughout the treatment. The white-cell count on admission was 8,000 and on discharge, March 5, 1941, was 7,800. The red-blood-cell count likewise showed no change. The eyes had quieted down, the lids were less thickened, and he was able to open them better. The pannus had practically disappeared. There had been some thinning of the corneal opacities, with slight improvement in vision. On April 3, 1941, a canthoplasty of the left eye was performed in the hope of improving lid function, but the conjunctiva was so limited that there was not much improvement. The vision on May 8, 1941, was O.D. 20/200; O.S. 20/200. Dr. Thompson stated that he presented this case for advice as to whether or not a corneal transplant would be indicated if the trachoma remains quiescent.

INJURY RESULTING IN DISLOCATION OF LENS WITH ATROPHY OF IRIS

DR. G. H. HOPKINS presented the case of a boy, L. L., aged four years, who sustained a blow to his left eye, dealt with a leather belt on January 2, 1941. At once the eye developed a severe hemophthalmos which gradually became absorbed. About three weeks later the iris became visible and seemed to be partially retroverted, with the lens dislocated backward. The tension had remained normal. The eye had not been irritated since February 8, 1941, but the iris and cornea had a brownish discoloration due to hemosiderin.

ATROPHY OF SCLERA

DR. F. NELSON presented the case of S. T., aged 33 years. His left eye had been lost about five years ago through a process in the cornea and iris of unknown origin. The right eye became inflamed in December, 1940. An extensive nodular scleritis developed in the upper section of the globe. The patient was treated with atropine, salicylates, and numerous tuberculin injections, and subsequently two mild X-ray treatments followed by 15 percent skin-erythema doses, unfiltered, and comparatively small doses of sulfanilamide, beginning with 20 grains a day and a gradual decrease in dosage for

about two weeks. The first X-ray treatment gave very little reaction. The second treatment caused very violent reaction but was followed by rapid improvement and final recovery of full vision, only a very slight atrophy of the sclera remaining in the upper nasal quadrant.

Brawny infiltration of the eye

Dr. G. H. Stine reported the case of Mrs. H. J., aged 39 years, whom he first saw in November, 1940. The patient complained that in the previous week the right eye had become very red and painful following the use of a solution of ferrous sulphate given her by a chiropractor to burn a growth off the right eye. Three months previously she had had an attack of pinwheel phosphenes before this eye, after which the visual acuity gradually diminished. For some time there had been a tender mass in the upper outer quadrant of the globe, which was not inflamed. Examination revealed an intensely inflamed and elevated mass in the upper temporal quadrant of the globe. The cornea was steamy, the pupil was fixed, irregular, and dilated, and there were fibrous exudates on the anterior capsule of the lens and fibrinous keratitic precipitates. The aqueous was turbid; the fundus reflex dark, except in the lower quadrant. The tension was elevated to 65 mm. Hg (Schiötz). The diagnosis was acute glaucoma, secondary uveitis; the possibility of intraocular tumor with external ocular extension was considered.

The patient's condition rapidly improved under retrobulbar injections of novocaine and adrenalin, paracenteses, and intravenous injections of typhoid H. antigen, so that five days later all symptoms and signs had diminished. A complete retinal detachment extending forward into the anterior vitreous was now plainly visible, also a staphyloma of the sclera about 5 mm. in diameter in the upper temporal part of the globe. The patient was advised of the possibility of an intraocular tumor, and on December 4, 1940, the right eye was enucleated and sent to the Army Medical Museum in Washington. The patient has made an uneventful recovery to date. The pathologic report from the Army Medical Museum disclosed a partially necrotic malignant melanoma of the choroid with involvement of the sclera. The patient was still alive and well, to his knowledge, nine months after the enucleation.

Albino nystagmus

Dr. Harry S. Rusk presented the case of O. C., aged 29 years, who complained of poor vision and nystagmus. Investigation of the family history revealed that the father and one sister had a similar ocular condition. The vision of the right eye was 6/60, of the left eye 3/60, unimproved by lenses. The visual fields were normal in the right eye; there was a slight general contraction in the left. Transillumination of the eyes revealed the absence of pigmentation found in albinos.

Vernal catarrh

Dr. Harry S. Rusk presented the case of J. T., aged seven years, whose right eye had been scratched by a cat, with resultant swelling of the conjunctiva and some discharge. The eyes were slow to clear up, and since that time the patient had had trouble with photophobia during both summer and winter. The condition, however, was worse during spring and summer. On both upper lids an elevation was present, somewhat like trachoma but without scarring and corneal involvement. The patient had had tuberculin

tests, elimination diets, local astringents and antiseptics, and heavy doses of sulfanilamide, but showed no improvement. The photophobia was improved when the patient was kept in the house. The conjunctival condition was somewhat improved when the patient remained in a dark room. This condition was probably vernal catarrh of unknown origin.

Harry W. Shankel,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

October 27, 1941

DR. HAROLD R. MULLIGAN, *presiding*

TRAUMATIC CYST OF THE IRIS

DR. H. MAXWELL FIELDS presented a case of a white man, aged 30 years, who sustained an intraocular foreign body in the left eye in September, 1940, as a result of chipping some steel. It was uneventfully removed through the anterior route without lens injury or detachment of the retina. Three months later the patient began to complain of irritation of the left eye, at which time he presented an anterior-chamber cyst growing from the upper angle and extending to about the middle of the anterior chamber. Dr. Fields said it fulfilled all the criteria of an implantation cyst; namely, translucency, tremulousness, and mobility, plus the history of an intraocular foreign body. Under the slitlamp it was seen to be attached to both the iris posteriorly and the cornea anteriorly, particularly at the site of a small triangular corneal scar at the 11-o'clock position just within the limbus. The content of the cyst was a gray turbid fluid with densly white, punctate, discrete deposits, probably epithelial pearls. The vision in the left eye was 20/400, and the ocular tension was normal. The right eye showed a picture of low-grade uveitis with keratitic precipitates, aqueous flare, cells in the anterior chamber, and posterior synechias. In view of the entire clinical picture a diagnosis of traumatic implantation cyst of the anterior chamber of the left eye and sympathetic uveitis of the right eye was made. The patient received intense treatment with sodium sulfathiazole, typhoid vaccine, mercury protoiodide, salicylates, plus the usual local therapy. Within three weeks there was no trace by slitlamp of any uveitis of the right eye. At the same time he was receiving X-ray radiation to the left eye, with resultant shrinking of the cyst to one half its original size. The vision of the left eye had improved to 20/50, while the vision of the sympathizing eye was now 20/20. In September, 1941, it was deemed advisable to remove surgically the remainder of the cyst, which had reached a refractory stage as far as response to X-ray therapy was concerned. This was done in an iridectomy through an incision "ab externo." As much of the cyst was removed as possible, in view of its attachment to the posterior surface of the cornea. The patient was given X-ray therapy postoperatively and there was no flare-up of symptoms in the right eye, which has remained quiet up to this time. The left eye showed only a tiny stump at the site of the corneal wound described previously, and there was no evidence of irritation. The vision in the left eye was 20/70 as a result of a faint rosette-shaped posterior cortical opacity in the lens, probably due to the irradiation. The patient is still under observation and will remain so for a long time.

SARCOMA OF THE IRIS

DR. A. R. ROBBINS described a white

man, aged 26 years, in excellent general physical condition, with 20/15 uncorrected vision in each eye. He had a tumor in the lower third of the iris approximately 2 mm. in diameter and apparently not extending to the root, causing a pear-shaped pupil. The duration of the tumor was unknown, as it was discovered during routine examination on March 24, 1941. Due to the location of the tumor an iridectomy was performed through an "ab-externo" approach, tearing the iris loose at the base. The patient now has 20/15 vision in each eye. Gonioscopic examination showed no abnormality at the angle. The ciliary process and zonule were normal, as was the posterior segment. There was no pathologic change in the other eye. Pathologic study of the tumor placed it in the spindle-cell "A" group. The argyrophilic classification (Wilder and Callender) showed a preponderance of fiber areas. These combined factors place the tumor in the lowest grade of malignancy among melanotic tumors.

Discussion. Dr. Whalman, in discussing Dr. Robbins's paper, referred to the publications of Dr. Algernon Reese and called attention to the fact that the history of the duration of melanotic tumors is of the utmost importance and that there is generally a history of at least five years' premalignancy existent before such tumors become dangerous. He also pointed out that most recent evaluation of melanomas show that only 5 percent of the group represented by this case metastasized at the end of 10 years.

Deep keratitis and glaucoma

Dr. Stephen G. Seech stated that it is not uncommon to find increased tension during the course of interstitial keratitis that clears up by itself; however, danger of increased tension is not over with the healing of the keratitis but persists for decades. He presented a case report of a man, aged 34 years, who had had inadequate treatment during an attack of interstitial keratitis at the age of five years. The patient had presented himself in June, 1941, when he complained of halos and fogging of both eyes of one year's duration. Examination showed the usual picture with corneal scars and numerous deep vessels. There were some posterior adhesions. The fundi were normal; the visual fields were normal. Tension in each eye measured 24 mm. Hg (Schiötz). With pilocarpine the tension was reduced in the right eye to 24 mm. Hg and in the left eye to 14 mm. Hg (Schiötz), when drops were used at least every two hours. Even with the frequent instillation the patient complained of foggy vision, and so iridectomy was performed on the right eye, bringing the tension down to 16 mm. Hg (Schiötz).

While this patient was under observation another patient presented himself with deep keratitis of one year's standing. The tension in the affected eye measured 40 mm. Hg, and in the normal eye 18 mm. Hg (Schiötz). The tension and fields in the former were controlled with pilocarpine.

Analyzing this form of glaucoma Dr. Seech said the injury of the cornea through the keratitis could be accepted as the originator of the increased tension in conjunction with the vascular changes that follow the subsequent uveitis. Patients should be carefully watched for a long period of time for increased intraocular pressure after the deep keratitis subsides.

Pulsating exophthalmos

Dr. Daniel E. Ziskin described pulsating exophthalmos and stated that he and Dr. David McCoy had collected and studied 10 cases of carotid-artery–cav-

ernous-sinus aneurysm at the Los Angeles County General Hospital. He stated that the literature records 795 cases of pulsating exophthalmos from 1809 to 1939. The etiology of this condition is generally traumatic rupture of the internal carotid in its passage through the cavernous sinus, while the next most frequent cause is a spontaneous fistula between the two resulting from dehiscences caused by arteriosclerosis. Arterial blood flows into the venous sinus reversing the flow of blood in the ophthalmic vein, resulting in stasis, edema, increased blood volume in the venous bed, and exophthalmos. The arterial pulsation is thus transmitted to the eyeball and surrounding orbital tissues. Dr. Ziskin described the syndrome as comprising a history of severe trauma followed by a period of unconsciousness, followed by symptoms of a swishing noise in the head and sometimes loss of vision, proptosis, loss of mobility, palpable regional thrill, regional bruit, and regional-vessel engorgement and swelling. Glaucoma is occasionally present. He said that treatment consists of rest, compression of carotid, and ligations. As an adjunct sclerosing agents in the dilated ophthalmic veins have been used.

Dr. Ziskin then presented a case report of a woman, aged 50 years, who slipped, fell, and bruised the side of her face in January, 1940. In October of the same year, while walking home, she complained of pain in the right eye, dizziness, frontotemporal headaches, and vomiting. The right eye began to protrude. She was aware of a buzzing noise in her head, but noticed no distortion of vision. When she came to the Hospital 10 days later her vision was 20/200 in each eye. The right eye was proptosed, markedly chemotic, and the conjunctiva protruded over the lower lid. There were also ptosis, subconjunctival hemorrhage, and total ophthalmoplegia, both external and internal, the visual axis being directed downward and outward. The disc margin was blurred and showed temporal pallor. The veins were engorged and the arteries were slightly narrow and pale. Bruit was audible over the right upper lid, but was stopped by right carotid compression. The left eye was essentially negative. Blood pressure was 146/100. X-ray studies of the skull and orbit were negative. No surgical treatment was advised. Two months later the vision in the right eye was reduced to faint light perception, and the vision in the left eye was 20/70. The external appearance of the right eye was unchanged. The fundus showed secondary optic atrophy with retinal vessels obliterated and replaced by fibrous tissue. Numerous retinal hemorrhages and exudates were disseminated throughout. The bruit and pulsation were present and an enlarged palpable superior ophthalmic vein was noted under the supraorbital ridge nasally. Ophthalmoplegia persisted. Surgery was advised and refused.

Discussion. Dr. M. N. Beigelman described a case of carotid-artery–cavernous-sinus aneurysm with paralytic esotropia due to paresis of the sixth nerve, in which a transplantation of parts of the inferior and superior recti muscles to the tendon of the externus was done. The important thing encountered during surgery was the profound venous oozing. A successful cosmetic result was achieved.

Dr. Whalman stated that these cases required special handling, out of the field of the average ophthalmologist, and should be under the care of the neurosurgeon who is prepared to perform intracranial ligations when necessary. He called attention to the work of Adson and Benedict at the Mayo Clinic where with

coördinated teamwork these cases are being handled successfully. It was his opinion that the only proper place for such cases was similar institutions where such organized management was available.

Harold F. Whalman,
Editor.

SAINT LOUIS OPHTHALMIC SOCIETY

November 28, 1941

DR. WILLIAM H. JAMES, *presiding*

ORTHOPTIC-CLINIC RESULTS

DR. J. H. BRYAN presented a paper on this subject. It represented a critical review of the type of case, the type of treatment, and the results obtained in the Washington University Eye Dispensary.

Discussion. Dr. A. D. Calhoun asserted that the majority of these patients were not given adequate orthoptic training, due to the fact that some were unable to get to the clinic often enough. The clinic is held two afternoons a week. Twice a week is not enough. Some patients had only 12 or 14 treatments in a year or 14 months. The procedure in the Orthoptic Clinic was to check on the measurements of preoperative cases. Treatment was not attempted on patients who had more than a 30-degree angle of squint. In order to get some degree of fusion after operation, vision was brought up by total occlusion first. Total occlusion will usually bring the vision up very materially in a period of a few months. In those cases where it was possible to get the vision up to 6/12 or 6/15, the ability to fuse increased considerably. Any degree of fusion was ordinarily impossible unless 6/12 or 6/15 vision had been obtained. The statistics of other clinics bear out the fact that the most important thing in orthoptic training is the frequency of treatment, three or four times a week in sessions of 15 or 20 minutes each time. Where this type of treatment was given it was possible to bring up the fusion in 20 or 24 sessions, and the results were average in 25 sessions of orthoptic training, mostly without operations. Operations were advised more frequently if the esotropia was 30 degrees or more. An attempt was made to get some degree of orthoptic training when children were too young. Favorable results were not obtained in children less than five years of age. The best age for training is in the seventh to the ninth year. In regard to total occlusion, it was one of the treatments recommended for abnormal retinal correspondence. With the good eye occluded, in order to bring up the vision in the poorer eye, the abnormal associations between the two eyes is being broken down at the same time. Until about a year ago, as far as the cases of abnormal retinal correspondence are concerned, he had not seen any cases corrected elsewhere. Abnormal retinal correspondence can be corrected. Orthoptic clinics in London have been getting results in abnormal retinal correspondence by orthoptic training alone in 50 percent of the cases. It required about 60 to 75 training periods to get rid of abnormal retinal correspondence in alternators. Alternators who have squinted since birth, if they can be helped, should show some improvement in 12 visits. It was possible to develop second and third degrees of fusion, but the training period was three times as long.

Dr. Lawrence T. Post said that he had been interested in the subject of orthoptics and regretted that they had not been able to have a technician at the school. Drs. Bryan and Calhoun had worked without a technician and had put in a great deal of time. He expressed his

appreciation of the efforts made by them and hoped that further organization would result in getting a technician.

Dr. H. R. Hildreth asked if total occlusion was tried on preschool or school children. He inquired whether in Dr. Bryan's experience there had been any evidence that some patients whose two eyes were made to function together developed symptoms or had ocular discomfort, and if there was any disadvantage in giving binocular vision to some patients.

Dr. William Meinberg asked if in cases in which a good cosmetic result was obtained, any of the patients had a persistent diplopia.

Dr. John Green asked what was meant by total occlusion and how it was brought about.

Dr. Bryan, in conclusion, said that total occlusion meant the covering of the dominant eye at all times during the waking hours and continuing until the vision was improved in the amblyopic eye or until it was apparent that there would be no improvement. Sometimes nine months in a year is required for occlusion. He used either a bandage or rubber suction cup behind the lens. If the person is wearing glasses it is probably more advisable to use the rubber occluder. It was tried with more enthusiasm on preschool children. On school children occlusion was advised during the vacation period, but then it was too hot and it was difficult to get them to keep the bandage on. In adults and older children orthoptic training often will not work because there is more discomfort when the two eyes are used together.

Thyroid and myopia

Dr. Max W. Jacobs cautioned against making a diagnosis of thyroid insufficiency on the basal metabolism rate alone, but stated that in the absence of other definite signs it may be an important or corroborative factor in making the diagnosis. Following Bothman's suggestion, thyroid extract was given to children showing progressive myopia, and these were followed for periods of from 2 to 10 years in the individual cases. On the basis of these histories the writer believes thyroid medication is worth trying in the presence of myopia if there is a hypothyroidism.

Discussion. Dr. H. R. Hildreth asked if Dr. Jacobs had any figures to show that myopia is common in hypothyroidism.

Dr. F. E. Woodruff inquired as to the dosage given.

Dr. William James remarked that Jamison, several years ago, recommended the use of thyroid injected into the eye, with beneficial results.

Unilateral glaucoma associated with herpes frontalis of the same side

Dr. J. F. Hardesty reported a case of congestive glaucoma associated with herpes frontalis of the same side as typical of a number of such cases seen during the past few years. The discomfort and persistence of the cases were worse than in the usual glaucomatous eyes. The distribution of the ophthalmic branch of the fifth cranial nerve was given in detail and speculation as to why glaucoma occurs in these cases was expressed.

Discussion. Dr. D. Bisno said he had a case of herpes zoster with very severe pain, and the vesicles had become infected. Two days following an injection of serum from a person who had recovered from herpes zoster, the patient was very comfortable.

Dr. E. Alvis said he saw three patients, none of whom had an increased tension but had definite herpes, whose pain was relieved after vaccination for smallpox.

Dr. William Meinberg said he had read that cobra venom was used in these cases with good results. X rays focussed upon the region of the face also helped.

Dr. John Green asked about the general medication. He stated that he had recently had a case of iritis with increased tension in a patient who had herpes frontalis, and in that case the eye was helped by the intravenous injection of sodium iodide.

Dr. Hardesty, in conclusion, said that in the cases he had seen, the glaucoma seemed to be definite congestive glaucoma rather than secondary glaucoma. The tension was under control in three weeks and remained under control. The discomfort of the eye persisted long after the tension was under control. There was the usual complaint of pain in the skin of the forehead and eyelids after the herpes was controlled. Someone else handled the general condition. The patient was referred to him because of the eye condition. He inquired whether herpes occurs more frequently in the ophthalmic branch or the mandibular branch.

Adolph C. Lange,
Editor.

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EPIDEMIC KERATOCONJUNCTIVITIS

The purpose of this editorial is to call the attention of the profession to the occurrence of serious outcroppings of epidemic keratoconjunctivitis in areas engaged in vital war efforts. Awareness of this will put ophthalmologists on the lookout for it, and may enable them to prevent its further spreading.

This disease was first described by von Stellwag in 1889. Since that time there have been occasional epidemics in various parts of the world. A severe epidemic was reported from San Francisco in 1941 (Hogan and Crawford in this Journal, 1942, volume 25, page 1059). An East-coast outbreak was reported by Berliner in the January, 1943, issue of this Journal.

The disease is ushered in by an acute purulent conjunctivitis of one or both eyes, in no way differing from other purulent conjunctivitides. A history of contact or association with some one having the disease can often be obtained because the trouble is propagated by direct transmission. The most frequent method in the present epidemic is apparently by the route of the medical examining and treatment rooms.

After a few days of acute conjunctivitis, gray plaques of infiltration of the superficial corneal layers appear. These tend to spread and become more numerous. They are located between Bowman's membrane and the surface layers of the epithelium. The regional lymphatics are almost always involved early in the course

of the disease. At the height of the attack vision may be reduced to 0.3 or 0.4. The average duration of the infection is about two weeks. A residual visual defect almost never persists, but the hours lost to work can be easily estimated to be tremendous when the possible incidence is calculated. Many cases have been reported from a single hospital. Several scattered regions of the country have been affected, but on going to press no cases are known to have been found in our armed forces. The possibility, almost probability, of this taking place can be estimated from the likely contact of soldiers and sailors home on leave as well as by other methods of transmission. The seriousness of an epidemic in our armed forces can be readily imagined.

Recently a virus has been isolated from epithelial scrapings and has successfully transmitted the disease to mice, from which it has again been produced (p. 230).

Unfortunately, no treatment has been found that will materially shorten the course of the disease. Mild antiseptics and washes seem as effective as any other therapy.

Nor is there any known prophylaxis. In order to stamp out this epidemic, one must therefore depend on the education of physicians, and particularly of those who are associated with the war industries, in the recognition of the disease and the strict isolation of any who are affected.

The history of past epidemics has been a rapid rise in the number of cases and then for no known reason an equally abrupt cessation of new cases in a given area. Obviously, however, one must not depend on such favorable happenings but must be on the alert to prevent the occurrence of new cases by isolation of those already affected and scrupulously observed asepsis in their treatment.

Lawrence T. Post.

ALDOUS HUXLEY A DISCIPLE OF W. H. BATES

As regards spectacles the modern civilized population is made up of those who have never experienced or suspected a need for wearing glasses, those who wear glasses because they think they must, and those who refuse to wear them because of personal prejudice or because some quack has preached the propriety or even the benefit of "throwing away your glasses."

It must be remembered that there are a great many people in whom the influence of vanity is so strong that they will do almost anything to avoid the wearing of spectacle lenses. We recall that the German genius Johann Wolfgang Goethe, although highly myopic, was so vain as to his personal appearance that he tried to avoid the wearing of glasses in the presence of others.

In his Wilhelm Meister's Wanderjahre, Goethe speaks of glasses as favoring darkness and inward falsity. At one point he remarks: "He who wears glasses regards himself as wiser than he is." Again: "Whenever I look through glasses, I am another person and am displeasing to myself; I see more than I ought to see, the world which I thus see more sharply defined does not harmonize with my inward self, and I quickly lay the glasses aside as soon as my curiosity as to the nature of this or that distant object is satisfied."

People of this type are a source of profit to the dishonest optometrist who pretends to cure refractive errors by eye exercises administered with the help of imposing machinery. Or they may seek the advice of a disciple of W. H. Bates, that queer American exponent of the healing art whose German followers have not hesitated to compare him with Christ, and who claimed to cure glaucoma, myopia, hyperopia, astigmatism, presbyopia,

cough, hay fever, rheumatism, trigeminal neuralgia, incipient cataract, syphilitic iritis, retinitis, and keratitis, and to relieve the toxic effects of typhoid, influenza, and gonorrhea.

Bates, it may be remembered, presented to the public a supposed group of animal experiments by which he claimed to have proved that accommodation in animals, and also in man, was due to the action of the superior and inferior oblique muscles. These experiments (largely on fishes) were performed in obvious ignorance of laboratory technique, and of the facts of human anatomy and comparative ophthalmology. Bates's contention that the crystalline lens has nothing to do with accommodation ignores completely the clear demonstrations of accommodative action which have been obtained with the slitlamp and in other ways. He was also quite ignorant of, or preferred to ignore, the indisputable evidence of astigmatic corneal curvature as presented by the ophthalmometer, although such evidence can be obtained repeatedly on the same patient at intervals of time and under varying conditions of rest and exercise, ocular use and disuse.

A fertile field for the activities of such ignorant or dishonest practitioners is to be found among those unfortunates who, in consequence of severe inflammatory or degenerative disturbances, have a great deal of irregular astigmatism, often in combination with a clouding of the media. Every ophthalmologist has some such cases in which his best efforts are incapable of giving the patient comfort or good vision. These people often go to many ophthalmologists, sometimes to many ophthalmologists and many optometrists, one after the other, until they are in utter despair of being helped.

What patients of this kind sometimes need more than anything else is to become resigned to their fate, and to cease striving after the impossible at great financial sacrifice and with much loss of mental repose.

Such a sufferer is Aldous Huxley, the well-known English novelist, now resident with his family near the California coast. Huxley, his publishers tell us, had the misfortune to suffer in his youth from a serious eye affliction which forced him to leave Eton College, and from which he was almost competely blind for three or four years. He succeeded in going through Balliol College, Oxford, by reading with a magnifying glass. Huxley himself speaks of a violent attack of keratitis punctata which left one eye just capable of light perception and the other with enough vision to permit of his detecting the two-hundred foot letter on the Snellen chart at ten feet.

Whatever may be our opinion of some of his literary productions, it is of course remarkable that a man so afflicted should have achieved such success in the world of letters. A man whose corneas were so clouded and distorted must have experienced great distress and repeated fatigue in the use of his eyes; and his many vain efforts to obtain substantial benefit from the wearing of spectacle lenses have no doubt had a good deal to do with his credulity concerning the Bates method.

In a recent volume of some 270 pages (The Art of Seeing, published by Harper & Brothers), Huxley accepts as gospel practically everything that Bates taught, and wraps around these teachings a fine frenzy of psychologic discourse. Although his psychologic dissertations contain many elements of truth and interest, they do not offer the least support for his contention that "orthodox ophthalmologists are content to palliate the symptoms of poor sight by means of 'those valuable crutches,' artificial lenses"; or

that ophthalmologists "work only on the sensing eye and ignore completely the selecting, perceiving, and seeing mind."

Such parts of Huxley's volume as have any value at all have been lifted from the works of writers on psychology. Of the physical facts of vision he knows very little. In passing, it may be remarked that the general value of publishers' announcements is seriously discounted by such a statement as that of Harper & Brothers —"established 1817"—that this book is a "rediscovery of the basic rules of vision." Aldous Huxley has rediscovered no basic rules of vision. He has not rediscovered anything at all.

What are the various therapeutic measures recommended by Bates, and repeated, with much amplification, by his disciple Huxley? Essentially they resolve themselves into a variety of maneuvers, some ludicrous but many obvious and quite lacking in mystery, to produce relaxation of the eyes and of the general nervous system. Never is substantial evidence presented to the effect that any person's vision was measurably improved by the exercises, or that the underlying refractive condition of the eyes was changed.

If when tired of reading you have covered your eyes with your hands, you have performed one of the classical "exercises" for the improvement of sight by natural methods," to quote the title of a book by another of Bates's ilk. This is practically what Bates would call by the fancy title of "palming." Such procedures as "blinking," "flashing," "winking," and "shifting" (moving the focus from one thing to another) prove upon examination to be merely further methods of mental, ocular, and bodily relaxation.

Huxley touches but little upon Bates's extravagant claims for the cure of serious eye diseases by means of so-called exercises. "The art of seeing," he says, "is not primarily a therapy; but at one remove and indirectly, it results in the relief or cure of many serious diseases of the eyes."

Naïvely, Huxley remarks that some of the procedures described may seem rather silly, childish, and undignified. Particularly recommended by Huxley, and perhaps original with him, is "nose-writing." "Sitting down comfortably in an easy chair close your eyes and imagine that you have a good long pencil attached to the end of your nose. . . . Equipped with this instrument, move your head and neck so as to write with your protracted nose upon an imaginary sheet of paper (or, if the pencil is thought of as being white, on an imaginary blackboard) eight or nine inches in front of your face. Begin by drawing a good-sized circle. Since your control over the movements of the head and neck is less perfect than your control of the hand, this circle will certainly look a bit angular and lopsided to the eyes of your imagination. Go over it half a dozen times, round and round, until the thickened circumference comes to look presentable." And so on and so on, for two pages.

We are assured that "A little nose-writing followed by a few minutes of palming, will do wonders in relieving the fatigue of a strained mind and staring eyes, and will result in a perceptible temporary improvement of defective vision. This temporary improvement will become permanent, as the normal and natural functioning fostered by nose-writing and the other procedures described in this book becomes habitual and automatic."

Huxley devotes so much space to rules for this sort of daydreaming that one wonders whether such modes of inducing mental abstraction may not have

played an important part in the artistry of his cleverly concupiscent* novels.

Apart from his more elaborate psychologic discourse, Huxley's book is essentially another paraphrase or re-arrangement of the original Bates volume. There are already a goodly number of similar works on the market, and we must assume that the demand for such writings is adequate to compensate the publishers for the risk and expense of placing them before the public.

Some of the people who labor under the sort of physical misfortune which Huxley has experienced may continue to frequent the Bates disciple or the dishonest optometrist or chiropractor, or may persuade themselves that they have been cured of their ocular defects. Such sufferers are to be pitied rather than blamed on account of their gropings. The relief which they seek can often, unfortunately, reach them only through mental healing, by way of consolation rather than physical cure. This is the type of healing to which Huxley himself appears to have attained. His error lies in the belief that the mind has cured the anatomically defective eye. W. H. Crisp.

BOOK NOTICES

READING AS A VISUAL TASK. By Matthew Luckiesh, D.Sc., D.E., and Frank K. Moss, E.E. Clothbound, 428 pages including index and glossary of technical terms, and 76 illustrations together with specimens of type and typography. New York, D. Van Nostrand Company, Inc., 1942. Price $5.00.

To quote from the Foreword, "The visual task of reading is the result of various factors, practices and conditions beginning with the typography and ending with the conditions which influence the reader's ability to see."

This book is largely an evaluation of these various factors. Among those considered are visibility, which is tested by a visibility meter, the tests showing that visibility increases greatly with increased illumination. Taking visual acuity as 100 percent with 1 foot-candle, the increase is to 130 percent with 10 foot-candles and crease under 100 foot-candles.

As measured by the heart rate, it was found that under poor illumination as reading progresses there was a relatively decreased pulse as compared with the decrease under 100 foot-candles.

A second factor is type size; in general, the larger the size, the greater the readability, but for usual purposes 10 to 12 point is optimum for average-sighted people. Also to be considered are the leading, the spacing, and the length of the line. Somewhat heavy print is desirable. Short lines and fairly wide spacing between words and lines are advantageous.

Many different methods of testing readability were employed, the blinking rate being considered of special value. Accounting the frequency of blinking after reading for one hour as 100 percent with 1 foot-candle, with 10 foot-candles this decreases to 77 percent, and with 100 foot-candles to 65 percent.

Black print on white paper is the most advantageous contrast. The paper should be nonlight-reflecting rather than highly glossed.

Reading performance is a complicated process, there being so many factors involved; such as illumination, refraction, brightness, contrast, glare, psychologic aspects, and various distractions. These are all discussed in detail.

The following recommendations regarding illumination are interesting: 100 foot-candles or more for very severe and

*One of his own favorite expressions.

prolonged tasks; 50 to 100 foot-candles for severe and prolonged tasks; 20 to 50 foot-candles for moderately critical and prolonged tasks; 10 to 20 foot-candles for moderate and prolonged tasks of office and factory, and when not prolonged, ordinary reading or sewing on light goods; 5 to 10 foot-candles for factory-controlled work in which seeing is important but more or less interrupted and casual and does not involve discrimination of fine details and low contrasts; 0 to 5 foot-candles, the danger zone for severe visual tasks and for quick and certain seeing. It is further pointed out that with increasing age greater illumination is necessary.

After reading one hour convergence-reserve decrease is 23 percent with 1 foot-candle, and with 100 foot-candles is only 7 percent.

This book is the best summary of facts known to the reviewer on this vital subject and there seems no gainsaying the direct advantage of good illumination for visual tasks, and the authors' special recommendations for type, paper, contrast, brightness, and such factors are indubitably sound.

Journal readers should be especially interested in this book because much of the material in it has been printed in original articles in this publication.

Lawrence T. Post.

THE VERTEBRATE EYE AND ITS ADAPTIVE RADIATION. By Gordon Lynn Walls. Clothbound, 765 pages including index and glossary, 197 illustrations. Bloomfield Hills, Michigan, Cranbrook Institute of Science, published as Bulletin No. 19, 1942. Price $6.50.

This is an extensive and comprehensive monograph covering most of the phases of the subject. The book is divided into three principal parts: Part 1 is basic and contains a discussion of light and its perception, the human eye as a typical vertebrate eye, the vertebrate retina, the visual process, and the phases of the vertebrate eye. The last named is divided into embryologic and evolutionary considerations. This section of the book ends with the discussion of elements of vertebrate phylogeny.

Part 2 is concerned with ecology, divided into adaptations to arhythmic, diurnal, and nocturnal activities and the adaptations to space and motion. In this section also is discussed the adaptation to media and substrates and also to photic considerations.

Part 3 is synoptic and deals with many genera: cyclostomes, higher fishes, amphibians, reptiles, birds, and mammals. Of special interest to the ophthalmologist will be Part 2. A basic factor in the phylogenetic development depends on the needs of the animal; whether he is driven to a diurnal or nocturnal existence or to some modification of one of these or a combination of all. The possibilities of pupillary modifications and retinal adaptations depending on the illumination of the environment of the vertebrate are pointed out.

In general, the diurnal eye shows a marked tendency toward cone development, this giving better acuity but less sensitivity to motion and minor light variations. On the other hand, the nocturnal animal usually has a predominance of rods in the retina. The animal with marked light sensitivity, because of the cone-rod distribution, often has a pupil capable of maximum contraction. Various devices to this end occur. Obviously the round pupil cannot contract completely. The slit pupil does better. Animals so provided have a mechanism to permit complete closure. Variations in

the fovea are extremely interesting. Certain birds have two foveas, so that they have acute perception of objects in two directions in one ocular position. A theory of the purpose of the typical V-shaped fovea is given, this being not to thin the retina overlying the cones in this area so much as to present a greater surface to the stimuli from the light source, because thinning is unnecessary since the overlying media are transparent.

The subject of the pecten in birds is discussed. Its purpose may be to produce a shadow on the retina exposed to direct sunlight, and thus increase the acuity.

The light-producing organs just below the eye in certain fishes present an interesting chapter, as do the divers methods of accommodation, varying from extraocular muscles which deform the cornea through bonelike ciliary circles that press directly on the lens, to the delicate mechanism in man. A long chapter deals with color vision and evidences for its existence in lower vertebrates. Some pages are given to protective colorations of the corneas and irides. Space does not permit even mentioning many of the fascinating subjects discussed in this book.

The illustrations are excellent, tending to be diagrammatic. Real students of ophthalmology can pass many pleasant and profitable hours in studying the contents of this book. Lawrence T. Post.

OBITUARIES

ALLEN GREENWOOD

1866-1942

Allen Greenwood was born in Chelsea, Massachusetts, on March 1, 1866, and died on October 24, 1942, at Miami, Florida. He graduated from the Medical School of Harvard University in 1889, thriftily dovetailing his last year with the two years' house officership at the Boston City Hospital. In 1898, at the close of service in the Spanish American War, he specialized in ophthalmology in Waltham, Massachusetts, where he had previously engaged in general practice. In 1900, he was appointed Visiting Ophthal-

mic and Aural Surgeon at the Waltham Hospital. He also opened an office in Boston, and in the following year was made Ophthalmic Surgeon to the Boston City Hospital.

A gifted clinician and dextrous operator, Dr. Greenwood took seriously the responsibility of encouraging to the limits of their ability his younger colleagues. He immediately started teaching and later held the Chair of Ophthalmology in Tufts Medical School. It was as lecturer at the Harvard Graduate School of Medicine that his influence was greatest. He organized one of the early and productive courses in ophthalmic surgery, developing in his students both skill and confidence. This was interrupted in 1916 by World War I. Dr. Greenwood served in France with the Harvard Unit, being commissioned Honorary Lieutenant Colonel in the Royal Army Medical

Corps. The following year, as member of the General Medical Board of the Council of National Defense in Washington, he compiled, with Dr. Walter R. Parker and Dr. George E. de Schweinitz the Manual on Ophthalmology for the Army Medical Corps. In 1918, he returned to France as Senior Consultant in Ophthalmology for the A.E.F. with the rank of Lieutenant Colonel. After serving in this capacity, experience in arranging courses for training the army ophthalmologists led him to obtain for internes at the Massachusetts Eye and Ear Infirmary formal instruction in relation to cases observed in the wards, and to advocate something similar in connection with the meetings of the American Academy of Ophthalmology and Otolaryngology. This developed into the notable Section on Instruction of the Academy.

He took particular delight in his service on the American Board of Ophthalmology. As perennial chairman of the Committee on Examinations he was largely responsible for establishing the strict standards of the Board, the pioneer examining board in the specialties. He seldom missed an examination, and after he was no longer able to take part in the oral quizzes, he insisted upon taking his quota of papers and case reports for correction, and served as referee in doubtful cases.

His sound judgment and progressive outlook brought him positions of distinction in the many special societies to which he belonged. He was chosen as Chairman of the Section on Ophthalmology of the American Medical Association; as President of the American Academy of Ophthalmology and Otolaryngology, and in 1941 was made President of the American Ophthalmological Society, the oldest special society in the United States.

Dr. Greenwood was a delightful companion and a generous colleague. He frequently asked patients from towns where his young colleagues were established "Why do you come to Boston when you have a good oculist at home?" Then he might contrive to convey to the local doctor his recommendations for the treatment. This building up of the skill, the prestige, and the morale of the men throughout his section brought him a large and loyal following. No man contributed more generously of his experience at professional gatherings or received more eager attention. Among his many important clinical papers, one of special significance dealt with the ocular indications for surgical interference in head injuries, summarizing his experiences as Chief Consultant in the War.

He loved travel, good poetry, a good story, good golf, warm friends. He is survived by his widow, Marion E. Tucker of Brookline, Massachusetts, and three children.

S. J. Beach.

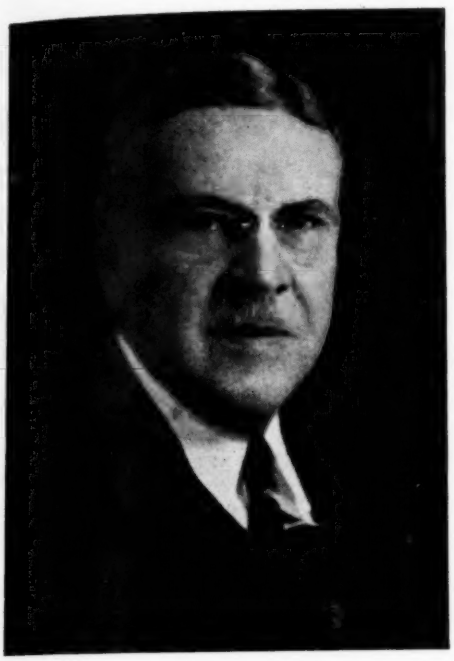
LUTHER CROUSE PETER
1869-1942

Dr. Luther Crouse Peter, the son of Rev. Jacob and Harriet Jane Crouse Peter, died at the age of 73 years on November 12, 1942, in the Graduate Hospital of the University of Pennsylvania. His death resulted from complications following an operation for an impacted gallstone in the common duct.

At the time of his death, Dr. Peter was Professor Emeritus of Ophthalmology in The Graduate School of the University of Pennsylvania, having been appointed to that position in 1940.

He was born in St. Clairsville, Pennsylvania, on February 14, 1869. His early education was in the schools in Manheim, Pennsylvania. In 1891, he was graduated from Gettysburg College, and in 1892 re-

ceived from that school the degree M.S. In 1894 he was graduated from the University of Pennsylvania in Medicine. Gettysburg College, in 1926, and Susquehanna, in 1934, awarded him, for causa honoris, the degree Doctor of Science. In 1938, Gettysburg also awarded him a



Doctor of Laws degree. Dr. Peter was a graduate member of the Phi Beta Kappa chapter at Susquehanna College, having been elected to postgraduate membership there in 1925.

Dr. Peter was a member of the Union League of Philadelphia, a Lutheran and Vestryman at St. John's Church in Rosemont, Pennsylvania, and a staunch Republican of firm convictions, keenly interested in national politics, with a rather extensive acquaintanceship with national and city party leaders. He was an omnivorous reader, being interested in all types of travel, biography, detective stories, and was well read in the classics, frequently using quotations from these, especially from Dickens, to illustrate a point in his conversation. He and his wife have travelled extensively abroad, and through the North American countries; as a matter of fact, at the onset of the present World War, rather extensive plans had been outlined for a trip throughout the Orient.

He married Carrie C. Moser on June 20, 1916. She survives him. They had no children. In spite of this, both Dr. and Mrs. Peter were always very much interested in the children of their friends. For several years, at least one of the two youngest children of his senior associate had Sunday morning breakfast with Dr. and Mrs. Peter on practically every Sunday they were in Philadelphia.

Dr. Peter's earliest interest was in neurology. He gravitated from this, however, into ophthalmology, and in 1910 was appointed Assistant Professor of Ophthalmology at Philadelphia Polyclinic Hospital and School for Graduate Medicine. In 1918, when the Philadelphia Polyclinic Hospital was absorbed by the University of Pennsylvania, he was appointed Associate Professor of Ophthalmology in the Graduate School, and a year later, Professor of Ophthalmology in that School. He was Professor of Ophthalmology at Temple University from 1917 until his resignation in 1930.

He was a member of the American Board of Ophthalmology from 1929 to 1937, its President from the period 1935 to 1937; Secretary of the American Academy of Ophthalmology and Otolaryngology from 1919 to 1926, and President of this Academy in 1928-29; elected to the American Ophthalmological Society in 1928, to the Philadelphia College of Physicians in 1917, and to Fellowship in the American College of Surgeons in 1920. In 1922, Dr. Peter was Secretary of the International Congress of Ophthalmology held in Washing-

ton, D.C., was guest lecturer at the Oxford Congress (England) in July, 1920, his subject being "Perimetry," and again in July of 1932, this time his subject being "The treatment of non-paralytic squint,"

Dr. Peter's book "The principles and practice of perimetry" appeared in four editions, and his "Extra-ocular muscles" in two editions. Throughout his active years of practice he contributed many articles on the extraocular muscles, perimetry, neuro-ophthalmology, and ophthalmic surgery.

Dr. Peter was a most capable and enthusiastic teacher of ophthalmology. His lectures at the Graduate School and at Temple University were always well attended, throughout his entire teaching life being a definite factor in the training of the many students who came in contact with him. This influence in ophthalmology should continue for many years to come. His life was well lived, the world of ophthalmology enriched by his efforts.

Edmund B. Spaeth.

SAMUEL HANFORD McKEE
1875-1942

On November 25, 1942, the relatively sudden death of Dr. Samuel Hanford McKee came as a shock to his many friends and admirers in the city of Montreal. He had been enjoying his usual good health until two weeks previously, when he was seized with an acute heart attack from which he never rallied. For the past few years and prior to the present war, following an attack of pneumonia, Dr. McKee had spent the more rigorous months of the Canadian winter in Florida and much of his summertime in Gananoque, Ontario, in the Thousand Islands.

At the outbreak of hostilities, when all departments in the Montreal hospitals were depleted, he was requested to re-enter the service of the Montreal General Hospital, from which he had only relatively recently retired. The proposition had only to be made to be readily accepted, although he nobly merited the rest to which his years of service at home and abroad entitled him.

Dr. McKee was born in Fredericton, New Brunswick, a son of the late Samuel Hanford McKee and Jane Armour, in 1875. After a preliminary education at the public schools of that city he matriculated into the University of New Brunswick, graduating with the degree of bachelor of Arts in 1896. He followed his medical course at McGill University, at Montreal, taking his degree of Doctor of Medicine from that institution in 1900. On graduation, Dr. McKee was appointed to the house staff of the Royal Victoria Hospital and soon came under the influence of Dr. Frank Buller, who had done much to fashion the careers of many young Canadian ophthalmolo-

gists. After a two-year service with Dr. Buller he proceeded to Germany, working with Axenfeld of Freiburg, and Greeff of Berlin; it was while with the former that McKee derived his greatest inspiration, and ocular bacteriology under such a master was destined to be his outstanding contribution to ophthalmology in his subsequent years of ophthalmic study.

On his return to Canada, Dr. McKee was invited to join the saff of the Montreal General Hospital, which institution he served with commendable loyalty and zeal until two years prior to his death. Dr. McKee was Ophthalmologist in Chief from 1931 until 1941. The faculty of medicine of McGill University was at once appreciative of the value of his talents, and after acting in the various junior positions he was finally appointed Professor of Ophthalmology in 1939, serving in that capacity for two years. Dr. McKee was Consulting Ophthalmologist to the Royal Victoria Hospital, the Children's Memorial Hospital, and to the Alexandra Hospital for Infectious Diseases. He also acted for the Dominion Government in the Department of Pensions and National Health.

In the first World War he served with distincton with the Canadian Forces and was twice mentioned in dispatches for conspicious services in the Gallipoli Campaign. On his return to England with the rank of Colonel he was appointed officer in charge of the Canadian Eye Hospital at Westcliff. He was awarded the Order of Saint Michael and Saint George.

On the cessation of hostilities Dr. McKee settled down to the pursuits of peace and applied himself enthusiastically to his scientific work. His contributions to ophthalmic literature were numerous; his chapter on "Ocular bacteriology" in Wood's "American encyclopedia of ophthalmology" marking him as an outstanding authority in that particular branch of the speciality. He was a guest speaker at medical societies in the United States on frequent occasions.

He was a member of numerous medical societies, including the American Ophthalmological Society and the Academy of Ophthalmology; but it was the Academy from which he derived his greatest enthusiasm and in which he formed his most enduring friendships. He was elected President of the Academy in 1932. He was also past President of the Montreal Medico-Chirurgical Society.

Dr. McKee did not allow his scientific work to eliminate forms of pleasurable diversion. He was a keen golfer and a member of the Royal Montreal Golf Club, while as a student he played football for his college in Fredericton. For many years he took a keen interest in badminton and was President of the Provincial Badminton Association for many terms. He was a member of the Mount Royal and University Clubs. Dr. McKee was an Anglican and attended the Church of Saint John the Evangelist. He is survived by his wife, the former Shirley Britton Cowen, also by one brother and three sisters.

Frederick T. Tooke.

CORRESPONDENCE

Dr. Edward Jackson—a founder of the section on ophthalmology, college of physicians of philadelphia*

The personal appreciation of Burton Chance

The modern development of ophthalmology had progressed so far by 1890, and the number of practitioners in the region of Philadelphia had increased to such an extent, that the Fellows of the

* Read at the meeting of the Section, on Thursday, December 17, 1942.

College of Physicians, specializing in ophthalmology, decided that they ought to petition the College to allow them to hold separate meetings at which their subjects might be discussed with greater attention than was then feasible at the meetings of the College. After serious consideration by the College, permission was granted, on November 5, 1890, to the 15 Fellows, who had signed the petition, to form themselves into a body, "to discuss subjects connected with Ophthalmology"; and a small lecture room was placed at their disposal, for one evening each month. It was definitely ordered, however, that those petitioners were not to become a society of ophthalmologists independent of the College, but should be simply a grouping of Fellows subject to the official regulations of the general College.

The first scientific meeting of the group was held on Thursday, November 16, 1890, at which Dr. William F. Norris was chosen chairman, and Dr. Edward Jackson, secretary.

Meetings were held regularly in the winter months, and, in time, gatherings developed into an organization occupying a distinguished place in medical affairs not only of Philadelphia but of the ophthalmic world; and the College, recognizing the importance of the "Society," in April, 1893, formally decided that it should become a permanent "Section" of the College, the first of the several sections formed for the transaction of scientific business.

Dr. Jackson was the most active person in the group. He had influenced them to join in the proposed organization, having, personally, written letters to the Fellows suggesting the project and urging them to sign the petition, and, for the four years during which he acted as secretary, the notes in the record book of the meetings and the abstracts of the scientific transactions are in his handwriting. It must have been highly gratifying to him to serve with Drs. Norris, Harlan, Thomson, and Oliver at the first meeting of this permanent organization on November 12, 1893.

Edward Jackson was born in Chester County, Pennsylvania, March 30, 1856, of a long line of Quaker ancestry, who had endowed him with the personal characteristics so distinctively manifested by the members of the Society of Friends.

Jackson's first intention was to become an engineer, and he graduated from the Scientific Department of Union College, New York, in 1874. Shortly after, he decided to enter medicine. Entering the Medical School at the University of Pennsylvania, he finished the course in 1878, immediately assuming practice in West Chester, where he continued for six or seven years and then moved to Philadelphia.

Almost from the beginning of his medical studies he became interested in and devoted to ophthalmology, the mathematical studies of the science, particularly, having attractions for him, without, however, lessening his occupation with the medical and surgical aspects of practice. Soon deciding to become an ophthalmologist, he determined that he would excel and that no matter how tedious and distasteful the course might be he would achieve success. In 1888 he joined the Polyclinic and School for Graduates in Medicine as Professor of Ophthalmology. Soon he became recognized as an authoritative teacher both here and abroad. In 1890 he was elected one of the surgeons of Wills Hospital.

A glance at a list of the subjects of the papers and reports published by him up to that date will impress one with his worthiness both as an absorbed scientist

and an active, forceful clinician. These publications relate not only to the refraction and motility of the eyes, in which chapters he has ever been outstanding as an authority, but to actual disease and prevention as well as to the surgery of the eye and adnexa, while never failing to relate the ocular symptoms with those of the body in general.

In 1894, because of the ill health of his wife, Dr. Jackson went out to Denver, Colorado, but he did not sever his Philadelphia connections. He returned after several months to conduct classes at the Polyclinic. In spite of that temporary residence in Denver, he, with indefatigable industry, interested himself deeply in both local and general medical affairs, and published numerous papers based upon his studies and observations in previous years, and endeavored to lay the foundations of a permanent residence in Colorado.

At the expiration of his leave of absence from the Wills Hospital, he returned to Philadelphia and for one month actively attended his services at the Hospital. I had known him prior to this, and had learned much about him from his former Chester County confrères, but his service that month at Wills became the memorable one of my own life. I was house surgeon and was his assistant and had the care of his patients. A "Cataract Week," too, had been planned for the Polyclinic students. Several patients were operated on daily. My experience at the Hospital had given me an appreciative estimation of what surgery could accomplish, yet I was especially impressed by the "technique" and success attending Dr. Jackson's performance—deftness, neatness, and prompt dispatch were the outstanding features. He commonly employed "simple extraction," for which he used a knife of his own devising, a combination of a Beers and a Graefe, with which he made a high corneal incision. Rarely had he to perform a secondary capsulotomy. My tabulated records of that period have been mislaid, yet I recall that the average stay of the patients was only 11 days. My first cataract operation was on one assigned to Jackson's clinic.

At the end of the month Dr. Jackson returned to Colorado, but he came East again in 1896, determining, however, to reside permanently in Denver. In 1898 he went back to Colorado, where, in time, he became Professor of Ophthalmology in the University of Colorado, a Chair he occupied until 1921. He organized Summer Courses for several successive years, to which resorted ophthalmologists from all parts of the country.

He was a true teacher and Mentor, displaying a genius for ophthalmology; always the professor and guide, both as the private practitioner and in his relation to the public health.

He was a most exact and conscientious observer; a student all his days. In his teaching and in consultation he was a severe yet kindly critic of his fellows, at the same time equally critical of himself

He had been elected a Fellow of the College in 1885. He always held his association with this Section deeply. It had been instituted by him; it was through his inspiration that the Fellows were brought together; and the Section was a growing concern by the time he removed to Denver. His experience in Philadelphia taught him how to organize professional groups elsewhere. He was one whose respect for his vocation was so great that from his earliest days, in season and out of season, he sought to place before the general medical men the ideals he, himself, strove to observe,

what part the ophthalmologist should take in his position in the profession, as well as to insist upon what should be accorded to ophthalmology for what it had done for general medicine. He was always the leader. As a teacher, his horizon was never the classroom, but the wide world.

He maintained his Fellowship in this College to the end. His membership in societies included all those in this country devoted to ophthalmology. All of us know of the offices he held in them, president or chairman, in local and national associations. Rarely did he attend a meeting without contributing a learned and useful essay, rising to discuss others on the program. In his own quiet way, he was always animated, always awake. At meetings the older members usually would wait before closing, expecting he would summarize and fix the topic in the assembly's mind, either in a recounting of an experience of his own, or by an analysis of the author's contribution. In argument and debate he was always considerate of his opponent, eagerly yet quietly seeking to present the truth as he had acquired it, backing up his statements by references to accepted authorities drawn from his marvelous knowledge and memory of what had been published the world over. At the meeting of the American Ophthalmological Association last May-June, he, well past the eighty-sixth year of his age, not only gave his own paper, but discussed several others—all with the freshest and ripest of spirit!

From others who intend to write of the life and works of Dr. Jackson you might be given analyses of the subjects of his publications arranged as though for the chapters in the medical sciences. I would refer only to the titles of what he put forth during his stay in Philadelphia. As one reads those titles it is to be noted that they stand as the bases of all the hundreds he published from Denver. Nothing in medicine could be insignificant to him, and by comment and editorials, to which he was never afraid to sign his name, he endeavored to present the facts or principles to the understanding of his readers.

Every aspect of ophthalmology interested him; he investigated all to the utmost with his inquisitive, well-ordered mind. His editorship of numerous journals and his authorship of separate works must be well known to you. His literary output was so extensive that a mere list of the titles and dates would fill many pages. In this element, too, of his endeavors he was the servant of his fellows, always the purveyor of knowledge and timely discoveries. The Year Books and Ophthalmic Literature alone, edited and issued under his own hand for a number of years until merged with the American Journal, are a monument of this feature. He did not confine his publications to the special journals, but sought to present facts and principles relating to ophthalmology in other journals of world-wide issue and influence. His writings were as expressive as his speech, simple, straightforward, and, in their simplicity, graceful.

In 1926, in honor of his seventieth birthday, his pupils and colleagues in the United States dedicated a collection of their papers which were published in a special volume as a fitting tribute to his personality and his life work among us. At the Wills Hospital is a striking portrait painted in 1939 to serve both as honor to the Hospital and in recognition of his greatness.

On the day of my first visit to him years ago, at his office on Seventeenth Street, I found him immersed in problems connected with skiascopy, that process of refraction of which he became

the greatest exponent. My last time with him was at the opening session of the Section on Ophthalmology of the American Medical Association, at Atlantic City, June, 1942. As we sat beside each other listening to papers on "The signs of old age," he leaned over to me and said, with an amused twinkle, "Those young fellows up there seem to know a whole lot about that subject." He might have stood up to refute, in his person, what they so voluminously were depicting as the characteristics of advanced years. Indeed, as already stated, only the week before he had taken part in the meeting of the American Ophthalmological Society at the Virginia Hot Springs.

For all the years I had known him, he seemed never to have changed, ever maintaining a slow, deliberate, calmly collected manner. During his time in Philadelphia I came under his influence at Seventeenth Street; again when I took charge of the office of his close friend, Charles Herman Thomas, on Locust Street, where he maintained an office and where George Gould occupied the second floor; and, at his last location, with Dr. Schneideman on Chestnut Street near Eighteenth.

Many honors and prizes were awarded him in his long life, and his portrait was painted for more than one group. These can express their own story, perhaps, but the Section of the College of Physicians of Philadelphia stands as a living memorial and we, today, should consider ourselves as his successors.

Tall and slender, Dr. Jackson, during the passage of years, seemed to have changed but little in his personal appearance. In his earlier days he wore a full black beard. Time did not seem to weigh heavily upon him, even up to last year. His death occurred quietly on Thursday, October 29, 1942.

His was an air of preoccupation. Always alert, he seemed like a man who was *listening,* and ready to answer any question put to him, or to respond to any statement uttered within his hearing. In speech, his diction was concise, terse, unemotional, exact—never redundant nor repetitive—calm, logical, expressive, and never pedantic. While seemingly introspective, he was responsive, lighting up his statements with apt phrases and pleasing humor. For myself, I always felt that one should be learned to know how learned he was, and, while reserved in manner, he ever seemed to be offering something useful to him who needed to be reassured in his questing.

His life was indeed one of service. As soon as he had learned something useful, he prepared it as a speech or published it as a written essay or article for the good of his fellows. While deeply involved in his laboratory investigations and in clinical observations, he never avoided the opportunity to apply his researches to the needs of his patients or to instruct us in the correction of defects and the alleviation of affections of the sick and suffering. While always absorbed in thought, he was no recluse.

A legion can look back to Edward Jackson's influence as the source of their success. He possessed to an extraordinary degree an influence which drew men together so that they might organize themselves into a body in order both to express their own observations and formally to present them to the world. It was impossible for him not to repeat the experiment of 1890 in Philadelphia.

Only a few remain to tell of Dr. Jackson's sojourn in this city, so that I humbly offer my tribute to so great a man, based upon what I had known of him both as a Philadelphian, and from meeting him from time to time, almost annually, until June last. He was always

the kindly friend, treating me as courteously when I first met him as when later he sought my help in certain projects.

In spite of the great successes which came to him in his life in the West, his affection for Philadelphia never waned. Miss Anderson, his long devoted assistant and secretary, wrote to me that when Dr. Jackson was discouraged, his thoughts would return to his early days in Philadelphia; and, I know, they dwelt on recollections of those worthy men who developed the "Philadelphia School of Ophthalmology" and helped him establish this Section of the College.

Tribute to Dr. Jackson

Editor in Chief,
American Journal of Ophthalmology:

In connection with the obituary that you will undoubtedly publish on the recent death of Dr. Edward Jackson of Denver, Colorado, you may be interested in having the attached resolution paying tribute to Dr. Jackson, which was voted by our Board of Directors during the annual meeting of this Society on December 3d.

Dr. Jackson served on our Board of Directors for many years and he was the first recipient of the Leslie Dana Gold Medal which has been awarded annually since 1925 for outstanding achievements in the prevention of blindness.

(Signed) David Resnick,
Director of Publicity.

EDWARD JACKSON, M.D., Sc.D.
1856—1942

Death has taken away one of the outstanding pioneers in the movement for prevention of blindness, Dr. Edward Jackson. He reached the ripe age of eighty-six, and was active to the very end of a career that was of the greatest service to mankind.

Dr. Jackson's efforts to conserve vision extended over a period of sixty years. In addition to being a distinguished ophthalmologist, he was also a trail blazer in the lay movement for the protection of eyesight. In recognition of his outstanding achievements in this field, he received the first award of the Leslie Dana Gold Medal when it was established in 1925.

His contributions to medicine—as teacher, writer and practitioner—were immense. He was surgeon to the Wills Eye Hospital in Philadelphia for several years, Professor Emeritus of Ophthalmology in the University of Colorado, Consulting Editor of the American Journal of Ophthalmology, and former president of all leading ophthalmological societies.

A modest and wise man, Dr. Jackson was long known affectionately as "the dean of American ophthalmologists," and his name was respected in scientific circles throughout the world. Men of his stature and attainments are rare, and difficult to replace.

The Board of Directors of the National Society for the Prevention of Blindness, notes the great contributions which he made to humanity, and requests that a minute of this appreciation be spread on the official records and a copy sent to Dr. Jackson's family.

The following letter was received from the honorable secretary of the Ophthalmological Society of the United Kingdom.

The Editor,
American Journal of Ophthalmology:

At the beginning of the war the Council of the Ophthalmological Society of the United Kingdom decided that all members of the Society who joined the

Forces should be exempted from paying their subscriptions for the duration of the war, while still retaining the full privileges of membership which include the receipt of all published Transactions.

My Council would like it to be understood that this ruling includes American members. All that is necessary is that the member concerned should inform the Treasurer, Sir Arnold Lawson, 12 Harley Street, London, W. 1, of his having joined the Forces, his date of joining, Unit and Rank, and also of any change of address to which communications may be sent.

In the event of any subscription having been paid since the member joined the Forces, the amount will be refunded.

I have the honour to be, Sir,

Your obedient servant,

(Signed) Frank W. Law, M.A., M.D., F.R.C.S.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Alvaro, M. E. **Apparatus for measuring the angle gamma.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 141.

This article consists only of five illustrations with descriptions of figures.

Davidson, Morris. **Stereoscopic vision in industry.** New York State Jour. Med., 1942, v. 42, Aug. 1, p. 1441.

The author shows why the testing and measuring of depth perception should be made routine practice by all oculists. Theodore M. Shapira.

Feldman, J. B. **Evaluation of ultraviolet light in ophthalmologic diagnosis.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1357-1361. (One figure, references.)

Friedman, Benjamin. **Factors which influence the objective visibility of opacities in the ocular media.** Arch. of Ophth., 1942, v. 28, Aug., p. 313.

An opacity of the media when observed with the retinoscope or ophthalmoscope is illuminated on its anterior surface by the source of light and is retroilluminated by light reflected from the retina and choroid. In addition, opacities in the vitreous receive some light on their anterior surface from rays that are scattered within the eyeball. On this account an opacity stands out more clearly by retroillumination if it is situated anteriorly. If the light source is at some distance from the eye, an opacity is seen more easily by light reflected from the retina. In this way the anterior surface is poorly illuminated and the contrast is better. The weaker light also reveals semitransparent opacities, which might be overlooked under brilliant illumination. John C. Long.

Garabédian, M. D., and Meunier, P. **Adaptometry.** Ophthalmologica, 1942, v. 104, Aug., pp. 65-85.

By means of an adaptometer, the author measured the course of dark adaptation in patients with hemeralopia. Thresholds of rod and cone sensitivity are distinguished and the speed of adaptation is represented by a curve

obtained by graphing the logarithms of the values found. It is shown that vitamin A favorably influences all hemeralopia due to food deficiencies, whatever the deficiency mechanism may be. In two patients with severe hemeralopia associated with hyperthyroidism, treatment with vitamin A improved the thyreotoxic symptoms. (3 figures, bibliography.)

F. Herbert Haessler.

Glück, Emil. **Clinical experiences with the sodium lamp.** Ophthalmologica, 1942, v. 103, June, p. 369.

The author reports on his critical evaluation of the sodium lamp. The lamp has no advantage over other sources of light in retinoscopy. It does not cause the pupil to contract more slowly than white light nor is it less dazzling. With it, on the other hand, the level of corneal scars is strikingly easy to estimate. The diffuse nebulae of interstitial keratitis are more readily transilluminated. The patient's visual acuity is also somewhat better in sodium light. F. Herbert Haessler.

Guibor, G. P. **The value of determining visual acuity at fourteen inches in children.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 144.

The purpose of the illiterate E chart for use at 14 inches is to differentiate a true amblyopia from blurred vision caused by overcorrection with convex lenses or by an unrelaxed ciliary muscle. It is invaluable in determining the visual acuity for near in all types of patient, and in 79 percent of the patients tested it corresponds in accuracy with the Snellen chart at twenty feet. (One figure, 2 tables.)

George H. Stine.

Preston, F. E. **Importance of night-vision tests.** Brit. Med. Jour., 1942, June 27, p. 800.

Statistics in regard to night-vision tests, giving the conditions under which accidents are most likely to occur, show that twilight yields a high percentage. Application for driver's license from the ocular standpoint merely called for ability to see certain standard characters in daylight, and nothing was done about night vision. A driver may have 6/6 vision and yet have badly contracted fields. No night-vision tests have been made before, because there have been none which the oculist could easily install in his examining room.

The Bishop Harmon disc-spotting night-vision test is suggested, as equally suitable for young and old and easily and quickly executed.

F. M. Crage.

Sugar, H. S. **A practical method of measuring the depth of the anterior chamber.** Amer. Jour. Ophth., 1942, v. 25, October, pp. 1230-1233. (3 illustrations, 1 table, references.)

2

THERAPEUTICS AND OPERATIONS

Bahn, C. A. **An inexpensive ophthalmic knife.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 138.

This inexpensive ophthalmic knife is made by Bard-Parker Company. It is made up of a special eye handle no. 9 with interchangeable blades nos. 11 and 15. (One figure.) (See also Amer. Jour. Ophth., 1941, v. 24, Nov., p. 1309.)

George H. Stine.

Bane, W. M. **Recession hook.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 136.

This is a squint hook with prongs

projecting from the sides of it to facilitate measurements in tendon recession. (One figure.) George H. Stine.

Gallardo, E., and Thompson, R. **Sulfonamide content of aqueous humor following conjunctival application of drug powders.** Amer. Jour. Ophth., 1942, v. 25, Oct., pp. 1210-1215. (5 tables, references.)

Goar, E. L. **An evaluation of recent therapeutic agents in ophthalmology.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, Sept.-Oct., p. 19.

This "address of the First Vice President" of the American Academy of Ophthalmology and Otolaryngology (1941) presents a very condensed review of recent therapeutic novelties under the following headings: cycloplegics and mydriatics, miotics, vasoconstrictors, vasodilators, foreign proteins and vaccines, the sulfonamides, thyroxin, heparin, hypertonic solutions, the vitamins, the hypotherm, and Beta radium-rays. (19 references.)

Hartmann, Edward. **Acetylcholine in ophthalmology and the treatment of ocular pain.** Arch. of Ophth., 1942, v. 28, Oct., pp. 599-612.

Acetylcholine produces at first a slight contraction of the peripheral arteries and arterioles, which is followed by dilatation. The capillaries are not affected. There is a slight drop in the blood pressure but much less than is found with vasodilators which act on the capillaries. The drug may be given either subcutaneously or intramuscularly in doses up to 0.2 gm. Acetylcholine is of value in overcoming the vasoconstrictor spasm of the arteries of the retina or optic nerve as found in intoxication by tobacco, alcohol, quinine, optochin, pentavalent arsenic and phenobarbital. Spasm of the posterior cerebral artery responds to this drug and hence it may overcome ophthalmic migraine or an attack of temporary hemianopsia. Retinal damage may result from the arterial spasm accompanying chronic endarteritis. While acetylcholine may have no effect on such endarteritis, it will relieve the spasm and thus help maintain the retinal circulation until the endarteritis is healed. The use of acetylcholine is more questionable in eye conditions resulting from permanent and progressive narrowing of the arteries due to angiosclerosis. While acetylcholine is of value in embolic arterial occlusion and in endarteritis, Hartmann prefers retrobulbar injection of procaine, which produces vasodilatation by blocking the afferent branch of the reflex arc. The pain and photophobia of a number of ocular diseases may be somewhat controlled by producing anesthesia of the sphenopalatine ganglion. This is best done by applying Bonain's solution against the pterygopalatine fossa above and behind the middle turbinate. Often this is followed by marked improvement in the ocular disease causing the pain. Retrobulbar injection of alcohol is of value in the relief of pain. If the eye is hopelessly blind 80 to 95 percent alcohol may be employed but if vision is to be preserved a weaker (40 to 45 percent) solution must be used. Alcohol injection is the best treatment for inflammatory glaucoma secondary to iridocyclitis. Magitot has used alcohol injections with success in painful iritis, phlyctenular keratitis, syphilitic interstitial keratitis and other anterior-segment diseases. Not only is there relief from pain but there is often some improvement in the causal disease. (Bibliography.) John C. Long.

Heath, Parker. **Some uses of chemotherapy in ophthalmology.** Jour. Mich. State Med. Soc., 1942, v. 41, April, p. 303.

The author discusses the indications for and management of certain ocular diseases, with respect to the sulfa compounds. Theodore M. Shapira.

Herrmann, H., Moses, S. G., and Friedenwald, J. S. **Influence of pontocaine hydrochloride and chlorobutanol on respiration and glycolysis of cornea.** Arch. of Ophth., 1942, v. 28, Oct., pp. 652-660.

The cornea can normally utilize oxygen directly from the air, hence it lends itself well to metabolic studies. It was found, using bovine corneas, that pontocaine and chlorobutinol inhibited the oxygen uptake of the tissue but that they greatly enhanced the aërobic accumulation of lactic acid. One hypothesis to explain these two phenomena is that the drugs attack the system intermediate between lactic-acid dehydrogenase and cytochrome oxidase. Alternate hypotheses are that the drugs enhance aërobic glycolysis or that they inhibit the resynthesis of lactic acid into dextrose. These drugs do not affect an oxygen-activating system, presumably cytochrome oxidase, nor anaërobic glycolysis. The oxygen uptake is also inhibited by soluble phenobarbital, phenacaine, butyn, atropine, and cocaine. John C. Long.

Kilgore, G. L. **A mask for eye operations.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1366-1367. (One illustration.)

Paton, R. T., and Abbott, H. B. **A headband plate for securing lid-traction sutures.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 139.

This is a metallic headband plate to which lid-retracting and superior-rectus sutures may be clamped by means of hemostats through the overlying drape sheets. (One illustration.)

George H. Stine.

Raffeto, J. F., and Nichols, S. **A nearly fatal reaction to sulfadiazine in a ten-year-old girl, involving skin, eyes, and oropharynx.** Jour. of Pediatrics, 1942, v. 20, June, p. 753.

Because of an acute follicular tonsillitis with adenitis and high fever, a 10-year-old child was given full doses of sulfadiazine for eight days. The drug was stopped for four days. Two days after again starting it in lower dosage, a rash was noted on the child's face and the conjunctiva was somewhat injected. The sulfadiazine was stopped but the skin and mouth eruption, conjunctivitis, and general condition became much worse, and the child had fever. During the second week an almost complete membranous mold of both the lower and the upper conjunctival fornix of the right eye was removed. In the third week the temperature reached normal, but there was some symblepharon formation, which was cut. Chronic conjunctivitis remained for several weeks. Whether the free period allowed development of hypersensitivity is an interesting conjectural question.

Ralph W. Danielson.

Rudolph, C. J. **A needle guide.** Trans. Amer. Acad. Ophth. and Otolaryng., 1942, Jan.-Feb., p. 135.

This needle guide furnishes counterpressure, makes suturing easier, and diminishes trauma. George H. Stine.

Sachs, E., and Yonkman, F. F. **The pharmacological behavior of the intra-**

ocular muscles. 5. The action of yohimbine and ergotamine on the dilator iridis. Jour. of Pharmacology and Exper. Therapeutics, 1942, v. 75, June, p. 105.

Yohimbine when used alone has no discernible influence upon the excised dilator iridis of albino rabbits but it antagonizes the action of adrenaline, with reversal of the adrenaline effect.

Ergotamine when used alone has a slight, inconsistent, stimulating effect upon the dilator. It is a powerful antagonist of adrenaline and can reverse the normal effect of a subsequent application of the latter. Even though it contracts the dilator, it does not act synergistically with adrenaline.

T. E. Sanders.

Sallman, Ludwig von. **Sulfadiazine iontophoresis in pyocyaneus infection of rabbit cornea.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1292-1300. (5 figures, bibliography.)

Simpson, R. K. **Needle and needle holder for ocular and intranasal use.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1368-1369. (2 illustrations.)

The sulfonamides in ophthalmology. Brit. Med. Jour., 1942, Sept. 12, p. 314. p. 314.

This résumé of the literature states that sulfapyridine has been the most successful in treatment of all types of ophthalmia neonatorum, and especially the gonococcal. Conjunctivitis due to the gonococcus and meningococcus responds better than those cases which are staphylococcic in origin. Hypopyon keratitis is often benefited. Trachoma is apparently improved to some extent by the effect on the secondary infection. The results in acute iritis and iridocyclitis are usually not good, and in uveitis they are disappointing. As to concentration in the eye from oral administration, there is probably little difference in the aqueous level of sulfanilamide and sulfapyridine. Sulfadiazine reaches high aqueous levels (about 75 percent of the blood level) after an initial lag, but sulfathiazole attains distinctly low concentration in the eye, somewhere about 20 percent of the blood level. As for the relative value of the various methods of local application, ointments are more effective than solutions in giving and maintaining high levels. The concentrations from local application have been found to be higher than could be obtained safely from oral administration. In man it has been possible to reach 20.7 mg. per 100 c.c. of the aqueous by insufflation of sulfanilamide powder into the conjunctival sac, a value about three times that obtainable by oral administration. In lower animals concentrations many times higher are obtainable. If concentration were the only factor in assessing the efficacy of a particular sulfonamide or of a particular method of administration it is clear that local therapy with soluble sulfonamides would be the method of choice. However, both clinical and experimental evidence seem at present to indicate that oral administration, in spite of its lower levels of concentration in the ocular tissues, gives much more satisfactory results. Ralph W. Danielson.

Weinstein, A. E., and Bender, M. B. **Contrasting effects of local application of adrenalin on the denervated iris of the cat and monkey.** Amer. Jour. Physiology, 1942, v. 135, Feb. 1, p. 535.

The authors show that experimental local use of adrenalin produces marked mydriasis, which is more conspicuous in the cat than in the monkey.

Theodore M. Shapira.

Winkless-Prins, C. **Postoperative astigmatism.** Ophthalmologica, 1942, v. 104, Aug., pp. 86-101.

Postoperative astigmatism is always irregular and consequently very disturbing, particularly after cataract extraction. It is caused by a scar in the cornea and sclera and the degree of astigmatism depends on the width of the scar. To obtain a thin scar one must prevent any tissue, even coagulated fibrin, from getting between the lips of the wound. If, throughout the operation, one is completely successful in keeping the wound edges moist with a 3-percent solution of sodium citrate, all fibrin coagulation is prevented. In consequence there will be perfect coaptation of the wound edges. The sodium citrate disappears from the tissues rapidly, so that a few minutes after its application is terminated none will remain on the wound edges to interfere with healing. Microscopic preparations of human and animal eyes show beautiful results after application of sodium citrate. (13 illustrations, bibliography.) F. Herbert Haessler.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Adler, F. H. **Ocular vertigo.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, Nov.-Dec., p. 27.

Ocular vertigo is a protective mechanism occurring whenever there is a conflict between sensory impressions from two or more of the organs of equilibrium. It is never very severe. It occurs chiefly at the onset of an ocular-muscle paralysis, but of course is due also to refractive errors, although seldom seen in cases of ocular-muscle imbalance. George H. Stine.

Brandenburg, K. C. **Aniseikonia.** Trans. Pacific Coast Oto-Ophth. Soc., 1941, v. 26, pp. 207-211.

The author briefly discusses the establishment of aniseikonia testing-centers under medical supervision in California during the past year. He says the condition should be suspected when several pairs of glasses by competent refractionists give little or no relief. However, the cases are too few and the equipment too expensive for the equipment to come into common use. A long list of symptoms which may be caused by aniseikonia is attached. The condition is especially important in flyers.

Lawrence G. Dunlap.

Burri, Clara. **Process of learning simultaneous binocular vision.** Arch. of Ophth., 1942, v. 28, Aug., p. 235.

Binocular vision, fusion, and stereopsis should be considered as complex cortical processes which are gradually learned through the first few years of life and not as functions of a fusion center which may be congenitally present or absent. Subjects with strabismus were given orthoptic exercises and their rates of improvement in fusion and stereopsis were charted. It was found that these charts were comparable with those of any learning process involving complex neuromuscular control such as walking or swimming. The author states that retardation or inhibition of the learning process for fusion and stereopsis may be an important factor in the development of squint and of reading difficulties. John C. Long.

Chance, J., Ogden, E., and Stoddard, K. B. **The effect of undercorrection and base-in prism upon the myopic refractive state.** Amer. Jour. Ophth., 1942, v. 25, Dec., pp. 1471-1474. (References.)

Chandler, A. C. **Contact lenses.** West Virginia Med. Jour., 1942, v. 38, June, p. 211.

A history of the development of contact lenses is given, and the method of fitting molded lucite lenses is explained. Spherical, cylindrical, and prism corrections can now be ground on these lenses. The indications for contact lenses are set forth, with reports of four cases of keratoconus in which contact lenses are worn comfortably by changing the fluid three or four times daily.

Edna M. Reynolds.

Cowan, Alfred. **Observations on the use of glasses.** Michigan State Med. Jour., 1942, v. 41, Feb., p. 134.

The mechanics of vision is reviewed and the purpose of correcting lenses is outlined. Certain false conceptions about the strength of lenses and lighting conditions are discussed.

Edna M. Reynolds.

Franklin, Isadore. **Fusion, projection, and stereopsis.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1316-1336. (6 figures, references.)

Friedman, Benjamin. **Observations on entoptic phenomena.** Arch. of Ophth., 1942, v. 28, Aug., p. 285.

This is a rather detailed discussion of a number of entoptic phenomena. The optic principles involved in the visualization of opacities in the media are illustrated. Folds and other irregularities in the corneal epithelium may be seen under suitable conditions. The author describes entoptically observed channels in the corneal stroma. Observable pulsation of the retinal vessels is discussed. Luminous striae may be seen when the eye assumes extreme positions of rotation. These probably result from the mechanical effect of traction on the optic nerve. A subjectively observed blue ring after prolonged severe pressure on the globe may be due to transient separation of the retina. By transillumination one may see the choroidal pigment at the same time as the retinal vessels are observed.

John C. Long.

Goldman, H., and Hagen, R. **Direct measurement of total refraction of the living human eye.** Ophthalmologica, 1942, v. 104, July, pp. 15-22.

The authors describe a method for estimating total refractive power of the eye. They found that measurements on the eyes of 18 subjects corresponded with Gullstrand's calculations.

The total refractive power of an optical system can be calculated if one knows the size of an object, the size of its image, and the distance between object and image. In the human eye the image size could not be measured because it was accessible only through the refractive media. However, it has been shown that the eye perceives roentgen rays. If in a dark room one exposes the dark-adapted eye to two narrow beams of roentgen rays, two vertical parallel lines are perceived as projected into space. One can then project two actual lines of light on to a wall which the subject fixates, changing the distance between the lines until they cover the images of the roentgen slits. The distance between the lines of light and the distance between the roentgen slits are then equal to the size of conjugate object and image (since the roentgen rays are not focused by the cornea and lens). If now one measures the distance from the wall to the corneal vertex, and also the length of the eye, one

has all the necessary data. The length of the eyeball is measured by projecting a narrow beam of roentgen ray in a plane which is perpendicular to the optic axis of the eye. The dark-adapted eye in a dark room then perceives a ring of light. If the plane of roentgen ray is moved backward, this ring becomes smaller until only a minute point remains before darkness supervenes. Just as the light sensation disappears the point has been reached where the plane of roentgen rays cuts the posterior pole of the eye. The apparatus is so arranged as to enable one to measure the position of the plane in relation to the corneal vertex. The formula for calculating total refractive power from these data is developed. When the subject whose eye is to be measured has had a little experience with the method, the error does not exceed 1 percent. (2 figures, one table.)

F. Herbert Haessler.

Hecht, S., Shlaer, S., and Perenne, M. H. **Energy, quanta, and vision.** Jour. Gen. Physiology, 1942, v. 25, July 20, p. 819.

This technical article reaches the following conclusions: (1) Direct measurements indicate that the minimum energy required for threshold vision corresponds to between 54 and 148 quanta of blue-green light. (2) These values are at the cornea. To yield physiologically significant data they must be corrected for corneal reflection, 4 percent; for absorption in the ocular media, 50 percent; and for retinal transmission, which is at least 80 percent. With these three corrections, the range of 54 to 148 quanta at the cornea becomes 5 to 14 quanta actually absorbed by the retinal rods. (3) This small number of quanta implies that, in order to produce a visual effect, one quantum must be absorbed by each of 5 to 14 rods in the retina. (45 references.)

Ralph W. Danielson.

Hofmann, W. P., and Carey, E. T. **Congenital myopic astigmatism in identical twins.** Amer. Jour. Ophth., 1942, v. 25, Dec., pp. 1495-1496.

Lancaster, W. B. **Nature, scope and significance of aniseikonia.** Arch. of Ophth., 1942, v. 28, Nov., pp. 767-775; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1942, 93rd mtg.

Aniseikonia is divided into two types, normal and abnormal or anomalous. Normal aniseikonia results from the lateral separation of the two eyes giving two different views of an object. Another normal form arises from the effect of nearness on the relative size of the image of an object on the nasal as compared with the temporal part of the retina. Still another form is seen in asymmetric convergence. Anomalous aniseikonia has been classified as meridional, over-all, cyclo type, and asymmetric. Each type produces characteristic effects on spatial localization. There is no evidence of the existence of any compensatory mechanism to cope with abnormal aniseikonia. Suppression is probably employed as a buffer. Premature fatigue may result from the struggle and frustration incident to attempts at binocular vision. The psychologic problem is discussed. Aniseikonia, in common with refractive errors and phorias, makes demands not only on psychic adjustment but on the adjusting mechanisms of accommodation, fixation, and fusion. The subject of space perception is not commonly understood by ophthalmologists. This leads to faulty understand-

ing of the problems of aniseikonia. (4 illustrations, references.)

John C. Long.

Lebensohn, J. R. **Ocular dominance and marksmanship.** United States Naval Med. Bull., 1942, v. 40, July, p. 590. (See Section 18, Hygiene, sociology, education, and history.)

Linksz, Arthur. **Determination of axis and amount of astigmatic error by rotation of trial cylinder.** Arch. of Ophth., 1942, v. 28, Oct., pp. 632-651.

The optical effect of rotation of a cylindrical lens before an eye with astigmatism is considered in detail, with an analysis of the resulting refractive conditions so induced. The larger the error in axis position, the larger is the resultant astigmatism. The author also clearly illustrates the principles of the cross cylinder and compares its use in axis determination with the method of rotation of the trial cylinder. (4 tables, 7 figures, references.) John C. Long.

Livingston, P. C. **Studies in night vision and night visual judgment as it concerns the ophthalmology of flying.** Irish Jour. Med. Science, 1942, June, p. 177.

The special visual attributes called for in recognition of aircraft and their management in the night sky are discussed in much detail. A high degree of dark adaptation is a valuable asset but it is not enough. Night vision, although not necessarily of a high order, is required for the safe handling of aircraft near the ground. The field of vision embracing those essential qualities of sight necessary for landing aircraft is far narrower than was at one time believed. It has been found that the influence of heterophoria upon landing depends upon whether the condition is inherent or acquired. The former is a definite cause of inconsistency in landing aircraft, while the latter exercises an adverse effect only when the condition is pronounced. Accuracy in analysis must be regarded as the most essential part of those features of night vision which may be grouped with the expression "night visual capacity." T. E. Sanders.

Márquez, M. **The great usefulness of bicylindric combinations in the exploration of astigmatism.** Amer. Jour. Ophth., 1942, v. 25, Dec., pp. 1458-1470. (References.)

Pascal, J. I. **Parallactic angle in binocular depth perception.** Arch. of Ophth., 1942, v. 28, Aug., p. 258.

The parallactic angle is a composite and dynamic angle produced by version and vergence binocular movements. The author illustrates with five geometric diagrams the dynamic composite character of the angle. A conservative estimate places the normal parallactic angle necessary for depth perception at between 5 and 12 seconds of arc. In the depth-perception tests of the United States Army and Navy Air Corps, a parallactic angle of more than 12 seconds is cause for rejection. The angle varies to a slight extent with the candidate's interpupillary distance. A large interpupillary distance is an advantage in depth perception.

John C. Long.

Post, L. T. **Aniseikonia.** Southern Med. Jour., 1942, v. 35, July, p. 649.

The existence of aniseikonia has been known for many years. Though there was occasional mention of it in the literature, nothing was done about the

condition until about 1924 when Ames, Gliddon, and Ogle became sufficiently interested to devise an instrument for its measurement. About ten years ago a few instruments became available and eight years ago one was placed at Washington University. Lenses were ground to include correction of the existing refractive error and a correction to equalize the unequal images.

Three years ago questionnaires were sent to patients for whom aniseikonic correction had been ordered. Approximately 33 percent had been entirely satisfied, a second 33 percent had been partly satisfied, and the remainder had found no benefit. From these answers the aniseikonic test was judged to be of real merit.

Criticisms of the test are clearly answered. The only instrument which measures the difference of image size is the one at Dartmouth. It is possible to grind glasses that correct oblique meridional aniseikonia.

One serious technical difficulty is that the tests cannot be made by the average ophthalmologist, since special instruments and special technique are necessary. The apparatus and correcting lenses are expensive, so that it is not now possible to have the test made on as many patients as might be desired.

Definite requirements are necessary and helpful. Beside having the apparatus and a technician, one must devote a large amount of his time to the tests. Coöperation with an ophthalmologist is essential. Muscle power and phorias must be studied. Tolerance for and amplitude of aniseikonia must be known.

F. M. Crage.

Putman, T. J., and Liebman, S. **Cortical representation of the macula lutea with special reference to the theory of bilateral representation.** Arch. of Ophth., 1942, v. 28, Sept., p. 415. (See Section 12, Visual tracts and centers.)

Sachs, Erich. **Some observations and experimental studies on the physiology of the ciliary muscle.** Amer. Jour. Ophth., 1942, v. 25, Nov., pp. 1277-1290. (2 illustrations, 13 tables, references.)

Wile, I. S. **Eye dominance.** Arch. of Ophth., 1942, v. 28, Nov., p. 780-790.

The author discusses the physiology of ocular dominance and its relationship to ocular function. From the clinical standpoint one must consider handedness as well as eye dominance. Unilateral cortical control is the rule, and contralateral neural pathways tend to create muscular and visual confusion. There are fewer complications in school work if the individual is congenitally right-handed and right-eyed. Some confusion results if the individual is originally left-handed and left-eyed, but this confusion is exaggerated if the person is trained into right-handedness. Fifty selected children with alexia were studied. These children had been brought for the treatment of maladjustments in behavior or personality. Left-eye dominance was twice as common in this group as was right-eye dominance. Of the children with left-eye dominance, 61 percent had become right-handed by conversion from an original left-handedness. A detailed statistical analysis is presented in tables. The significance of dominance of the left eye in dyslexia is striking. The problem is not simply one of which eye is dominant but originates in the total organization of the individual in terms of eye-hand association and coordination. Methods of treatment for the various problems encountered are outlined. The success of these training methods is demonstrated by improve-

ment of 92 percent of the children in the series studied. The author suggests that the ophthalmologist make determinations of ocular dominance a routine. (3 tables.) John C. Long.

Wilson, Alfred. **Combination of cross cylinder and astigmatic chart in correction of astigmatism.** Arch. of Ophth., 1942, v. 28, Sept., pp. 490-492.

The author states that in his experience the cross cylinder has been the most valuable instrument in the determination of astigmatism and that the astigmatic chart has been at best secondary. The use of the astigmatic dial in combination with the cross cylinder has been of considerable value as a check on the axis and amount of astigmatism. A rather simple method of employing the two together is described and illustrated with eight dial diagrams. Marked irregular astigmatism can better be corrected by use of the cross cylinder and visual determinations without the dial.

John C. Long.

4

OCULAR MOVEMENTS

Courtis, B., and Sitler, R. **Considerations on hereditary ophthalmoplegia and the ophthalmoplegic type of myasthenia.** Arquivos Brasileiros de Oftalmologia, 1942, v. 5, Aug., pp. 163-179.

Two cases are described and contrasted. A woman of 32 years, with a previous diagnosis of Basedow's disease, came for completion of a clinical study. She had a slight ptosis of both lids, inclination of the head backward, and contraction of the frontalis muscle. When requested to direct her gaze in various directions, she executed movements of the head which were interpreted as compensatory in relation to some disturbance of ocular motility. She could open and close the eyes normally except as affected by the ptosis. There was extreme limitation of all the extrinsic movements of the eyeballs. But intrinsic motility was preserved, the pupils reacting well to light and accommodation, directly and consensually. There was no diplopia, and the sensitivity of the eyeballs was normal. Intraocular tension, visual fields, and ophthalmoscopic findings were normal.

The disturbance of ocular motility had existed since birth. The patient's father and one sister out of four sisters and three brothers presented the same anomaly. Neurologic examination showed slight paresis of the right facial nerve, hypotony of the arms and legs, and a definite reduction in the pharyngeal reflex.

The second patient, a woman of 24 years, came on account of marked ptosis, with contraction of the frontalis muscle. Ocular motility was decidedly limited in all directions, but retained an amplitude varying between 15 and 20 degrees. Intrinsic motility was normal and there was no diplopia. The ptosis had been noted since birth. The disturbances were said to show slight improvements and exacerbations, with an accentuation about a week before menstruation. The legs showed muscular weakness and the arms a lesser degree of weakness; and the patient tired easily, especially toward evening. About the age of 12 years she had presented disturbances of deglutition, and at times her speech was rendered difficult by fatigue. The prostigmin test gave a positive result for myasthenia of the ophthalmoplegic type.

The author emphasizes particularly the value of the prostigmin test for myasthenia. This consists in hypodermic injection of 1 to 1.5 mg. of pro-

stigmin. In the course of 15 or 20 minutes the positive case shows diminution of fatigability and greater functional capacity of the muscles. In the author's case of myasthenia of the ophthalmoplegic type the prostigmin diminished the ptosis and increased the range of movement of the eyes in all directions; and the patient felt better on the days when prostigmin was injected.

The author summarizes the literature of the two conditions, and gives a three-page bibliography.

W. H. Crisp.

Fowler, M. J. **Value of orthoptic fusion training exercises in strabismus and related conditions.** Arch. of Ophth., 1942, v. 28, Sept., pp. 507-521.

This is a comprehensive report of the results obtained by orthoptic training exercises in cases of strabismus, as carried out by one trained ophthalmologist under thoroughly favorable conditions. Of 182 cases of strabismus (161 of convergent and 21 of divergent) successful results were obtained in only two cases. Attempts to improve the range of fusion in accommodative strabismus and in cases of abnormal retinal correspondence were failures. Fowler concludes that preoperative and postoperative orthoptive training are of no value in cases with abnormal retinal correspondence, as this defect usually prevents the development of fusion. The major amblyoscope gives prognostic and diagnostic information of great value in cases of strabismus and anisometropia. Based on results obtained, the author states that occlusion and the use of glasses constitute highly satisfactory treatment for accommodative convergent strabismus. Nonaccommodative strabismus is best treated by the wearing of fully correcting lenses and occlusion of the better eye. This is followed by surgery if the squint exceeds 10 degrees. Orthoptic fusion training is contraindicated in this condition, as it does no good and may provoke an annoying diplopia. In divergent strabismus orthoptic exercises are only of value if there is a moderately low range of fusion. Pencil convergence exercises at home are effective only in those who have a remote near point of convergence. The treatment of divergent squint is largely surgical. (3 tables, bibliography.)

John C. Long.

Inciardi, J. A. **Cure of depression of lower lid following reinsertion of inferior rectus muscle.** Arch. of Ophth., 1942, v. 28, Sept., pp. 464-467.

The inferior oblique muscle passes laterally and backward from its insertion to go beneath the inferior rectus muscle. The sheaths of the two muscles become associated where they cross to form the suspensory ligament of Lockwood. An anterior prolongation of the sheaths is attached to the tarsal plate of the lower eyelid. This relationship is responsible for the ectropion and lagging of the lower lid and a widening of the palpebral fissure that accompany severance of the inferior rectus muscle. The author reports the case of a 16-year-old girl who supposedly had earlier had a tenotomy operation on the left inferior oblique muscle for convergent strabismus. Following the operation the left eye took a new position much higher than the right. The right palpebral fissure was 9 mm. and the left 16 mm. in width. In the primary position there was left hypertropia of 21 arc-degrees, which increased to 35 degrees in the lower fields and decreased to 14 degrees in the upper fields. An operative approach was made through an inferior conjunctival

incision. The inferior rectus muscle was found to have been severed and to have retracted considerably. The muscle was isolated and sutured to its original insertion. The inferior oblique muscle was then divided near its insertion. Obviously the previous operator had severed the inferior rectus muscle, mistaking it for the oblique. Following the surgery there was left hypertropia of 7 arc-degrees in the upper fields and primary position, and left hypertropia of 14 arc degrees in the lower fields. The right palpebral fissure was 9 mm. and the left 11 mm. There was considerable cosmetic improvement. In an oblique tenotomy operation the author stresses the importance of avoiding the point where the oblique and rectus muscles cross. In this way one is less apt to mistake the inferior rectus for the inferior oblique. John C. Long.

Lordon, J. P. **Teno-recessions.** Trans. Pacific Coast Oto-Ophth. Soc., 1941, v. 26, pp. 200-202.

The author describes briefly his technique, which attempts to combine the good features of tenotomy with the undeniably excellent effect of recession. Tenon's capsule is dissected free from the tendon at its attachment and the central portion of the tendon back toward the muscle is removed.

Lawrence G. Dunlap.

O'Connor, Roderick. **Contraction in ocular muscle paralysis.** Trans. Pacific Coast Oto-Ophth. Soc., 1941, v. 26, pp. 132-137.

The author reiterates the statements he has been making for the past 25 years that it is absolutely necessary to operate before contractures have started in the opponents and that the test for contractures should be made every week and operation done as soon as the test becomes positive in the slightest degree.

Lawrence G. Dunlap.

White, J. W. **Review of twenty-seven years with the obliques.** Trans. Pacific Coast Oto-Ophth. Soc., 1941, v. 26, pp. 112-131.

White reviews his experience of many years in oblique muscle surgery. He upsets many heretofore accepted theories and ideas, especially as relating to tropias and vertical phorias of high degree. Ten cases, illustrating various paralyses, are concisely recorded, each of them being accompanied by an instructive diagrammatic drawing. From his long service with Duane, as well as his own experience, White disagrees entirely with Graefe's warning, "hands off the obliques."

Lawrence G. Dunlap.

5

CONJUNCTIVA

Beltrão, Romeu. **Trypanosomic or Chagasic conjunctivitis.** Arquivos Brasileiros de Oft., 1942, v. 5, Aug., pp. 180-185.

The eye sign described by the author plays an important part in the symptomatic picture of Chagas's disease, or American trypanosomiasis, in which it has an important diagnostic value. It consists in a unilateral bipalpebral edema, whose intensity may reach the point of completely occluding the eye. The lid swelling is painless, hard, nondepressible, without alteration in the color of the skin, and continuing variably for days or even months. It may be accompanied by conjunctival hyperemia, secretion, dacryoadenitis, dacryocystitis, keratitis, corneal ulcer, and exophthalmos, among other conditions. A regional ganglionic reaction is seldom absent, the preauricular gland being

more frequently involved than the submaxillary.

It is a matter of historical interest that this eye sign served the author in diagnosing the second acute case of Chagas's disease demonstrated in the Brazilian state of Rio Grande do Sul, which case served as a point of departure for the discovery of many other cases. (3 photographs.)

W. H. Crisp.

Francis, Edward. **Oculoglandular tularemia.** Arch. of Ophth., 1942, v. 28, Oct., pp. 711-741.

This is a review of data from 78 cases of oculoglandular tularemia originating in the United States and from 18 cases in foreign countries. The conjunctiva is especially vulnerable to the infection, as demonstrated by the fact that out of the 78 cases the hand was infected in only six although exposed to the same contamination. Fifty-six of the American cases were contracted from wild rabbits. Tick tissue mashed between the fingers and conveyed to the eye accounted for ten cases. Others originated from flies, ground hogs, tree squirrels, and dogs. The disease was unilateral in 67 cases and bilateral in seven. In addition to enlargement of the preauricular, submaxillary, cervical, and other lymph nodes there were the constitutional symptoms common to the disease. Dacryocystitis occurred in five cases. The cornea became ulcerated in six cases and perforated in one resulting in enucleation. The mortality was 9 percent as compared with a mortality of 6.9 percent in 15,525 cases of tularemia of all types in the United States. The 18 foreign cases originated in Alaska, Japan, Russia, Norway, Canada, Sweden, Austria, Czechoslovakia, Turkey, Italy, and Germany. In general the foreign infections showed a much lower virulence. Only two deaths have been reported from 2,384 foreign cases. Imported strains have also had a lower virulence for laboratory animals. The author discusses the confusion concerning Pascheff's disease, pseudotuberculosis rodentium, and a Japanese series reported as possibly of virus origin. It is probable that all were cases of tularemia. In this country the term Parinaud's conjunctivitis is used in a negative sense, implying a conjunctival glandular syndrome not due to Bact. tularense. (4 tables, extensive bibliography.) John C. Long.

Lever, W. F., and Talbott, J. H. **Pemphigus.** Arch. Dermatology and Syphilology, 1942, v. 46, Sept., p. 348.

Clinical reports and follow-up studies on all patients with pemphigus admitted to Massachusetts General Hospital between 1921 and 1936 are presented. Ten of the total 62 cases were of conjunctival pemphigus. Oral lesions were found in 90 percent of these cases but all recovered, in marked contrast to the patients with pemphigus vulgaris where the mortality rate was 79 percent. Edna M. Reynolds.

Martin, W. O. **Parinaud's oculoglandular syndrome. Treatment with sulfathiazole.** Amer. Jour. Ophth., 1942, v. 25, Dec., pp. 1493-1495. (2 case reports, 4 illustrations.)

Pinho, Edson. **Sulfapyridine in acute catarrhal conjunctivitis.** Arquivos Brasileiros de Oftalmologia, 1942, v. 5, Aug., pp. 190-193.

The author makes the interesting observation that, although in the United States this condition is usually due to the pneumococcus, in Brazil, as in all tropical climates and in the cities along

the sea coasts of Europe, it is more frequently produced by the Koch-Weeks bacillus. In these cases, Pinho has found it distinctly advantageous to associate with other treatments the internal administration of sulfapyridine at the rate of 0.04 gm. per kilogram of body weight (presumably daily, although not stated in the article).

W. H. Crisp.

Raffetto, J. F., and Nichols, S. **A nearly fatal reaction to sulfadiazine in a ten-year-old girl, involving skin, eyes, and oropharynx.** Jour. of Pediatrics, 1942, v. 20, June, p. 753. (See Section 2, Therapeutics and operations.)

Sanders, Murray. **Epidemic keratoconjunctivitis ("shipyard conjunctivitis").** Arch. of Ophth., 1942, v. 28, Oct., pp. 581-586.

This is a preliminary report on investigations into the etiology of epidemic keratoconjunctivitis. This condition broke out in the San Francisco shipyards in 1941 following a similar epidemic in Hawaii. It has since spread throughout the Pacific coast area and has reached the east coast. The cause of the disease is unknown although evidence points to a nonbacterial agent, a virus.

Swiss mice were injected intraperitoneally and intracerebrally with conjunctival scrapings from patients with the conjunctivitis. This was followed by mild symptoms from which the mice recovered. Brain emulsion from the second mouse-passage was incubated in tissue culture of embryonic mouse-brain. This produced a strain which was lethal to mice and gave rise to a pathologic picture which though not unique did not resemble that in other common virus infections. Conjunctival instillation of the mouse virus in a human volunteer produced in four days a mild conjunctivitis. When this was repeated in the same eye typical keratoconjunctivitis developed. The serum of the patient from whom the original material was obtained had a neutralizing effect on the mouse virus. A second isolation of virus has been effected, but the identity of this virus with the first has not been fully established. This is a preliminary report and further work will be done on the isolated strains of virus. (References.)

John C. Long.

Sweet, L. K. **Chemotherapy in acute gonococcal conjunctivitis.** Amer. Jour. Ophth., 1942, v. 25, Dec., pp. 1487-1492. (3 tables, references.)

6

CORNEA AND SCLERA

Bereston, E. S., and Baer, R. L. **Keratoconus associated with atopic dermatitis.** Arch. Dermatology and Syphilology, 1942, v. 46, Sept., p. 358.

Two cases of conical cornea associated with atopic dermatitis are reported.

Edna M. Reynolds.

Boshoff, P. H. **Hyaline scleral plaques.** Arch. of Ophth., 1942, v. 28, Sept., pp. 503-506.

In spite of the scanty literature on the subject, hyaline degeneration of the anterior portion of the sclera is fairly common. The author has observed 11 cases of this condition. Hyaline plaques are situated about 3 mm. from the limbus and about 2 mm. from the muscle insertions. They always bear a definite relationship to the muscle insertions. The plaques are most commonly observed in front of the medial rectus, less commonly before the lateral, and rarely before the in-

ferior rectus. Usually the hyalinized regions are 2 mm. broad and 6 mm. long but they may be as small as an ordinary pinhead. They vary in depth, at times involving seven eighths of the scleral thickness. The areas involved are neither elevated nor depressed, nor is the overlying conjunctiva affected. On transillumination the hyalinized regions show up as relatively translucent windows. The condition occurs in elderly people, especially those with a gouty or rheumatic diathesis. It is probable that the plaques are directly due to a local deficiency in blood supply, resulting in hyaline degeneration of the scleral fibers. The condition does not ordinarily affect the health of the eye, but rupture of the sclera might occur through such a plaque if the eye were contused. (One illustration, references.) John C. Long.

Cogan, D. G., and Kinsey, V. E. **The cornea. 5. Physiologic Aspects.** Arch. of Ophth., 1942, v. 28, Oct., pp. 661-669.

The authors have previously presented experimental data demonstrating that the epithelium and endothelium of the cornea serve as membranes semipermeable to sodium chloride. The intact cornea may be kept in a state of relative deturgescence by bathing either of these layers in a hypertonic salt solution. These findings may be applied to the normal physiology of the eye to explain the relative deturgescence of the eye cornea. There is an equilibrium between the inherent imbibitory capacity of the corneal tissues and the osmotic forces acting at the corneal surfaces. The cornea is not protected at its margins by any semipermeable membrane, so it is assumed that fluid enters the cornea peripherally from the scleral plexus and escapes by osmotic pressure from both anterior and posterior surfaces. This gives rise to a definite circulation of fluid and explains the observations on the experimental staining of the cornea with dyes and also the clearing of hematogenous pigmentation. Such circulation, as brought about by the continuous loss of water from the surfaces, may carry oxygen and other metabolic products from the blood to the avascular cornea. The difference in transparency between the cornea and sclera is largely due to the difference in water content. If the cornea becomes turgescent, as it does when either of the membrane barriers is destroyed, it loses much of its transparency. The sclera, having no semipermeable membranes for protection, is normally in a state of turgescence. If water is withdrawn from the sclera this structure becomes relatively transparent. (One drawing, references.)

John C. Long.

Lepard, C. W. B. **Pyocyaneus ulcer.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, Nov.-Dec., p. 55.

The author reports three cases which were resistant to all forms of local treatment, but one of which responded favorably to sulfapyridine therapy. The diagnosis was made by bacteriologic examination of the discharge. The organism may exist in an aqueous solution of fluorescein. (Discussion.)

George H. Stine.

Sanders, Murray. **Epidemic keratoconjunctivitis ("shipyard conjunctivitis").** Arch. of Ophth., 1942, v. 28, Oct., pp. 581-586. (See Section 5, Conjunctiva.)

Verma, O. P. **Further experience of the treatment of superficial keratitis**

with riboflavin. Indian Med. Gazette, 1942, v. 77, Aug., p. 471.

Aykroyd and Verma recently reported 13 cases of superficial keratitis in which dramatic results were obtained by injection of riboflavin. Since that paper was prepared, a further series of fifty cases have been observed and treated with similar results. The symptomatology consisted of photophobia, itching, burning, pain, lacrimation, and dots and streaks in the superficial layers of the cornea, with ulcers and vascularization in some cases. Angular stomatitis, fissured tongue, and mild dermatitis of the scrotum were present in a high percentage of the cases and these were also improved by the riboflavin. The parenteral dose was 2 mg. daily; larger amounts were given by mouth. The author suggests that riboflavin may prove a valuable adjuvant to other forms of treatment, especially in trachoma. (8 case reports.)

Ralph W. Danielson.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Appel, M., Saphir, O., Janota, M., and Strauss, A. A. **Complement-fixing antibodies (Brown-Pearce carcinoma) in the blood serum and in the aqueous fluid of the anterior chamber of the eye.** Cancer Research, 1942, v. 2, Aug., p. 576.

Intracutaneous transplantation with the Brown-Pearce carcinoma results in a tumor which often grows to a certain size, then regresses, and leaves the animal immune to subsequent growths. However, such growth does not confer protection against growth of this tumor in the anterior chamber. The authors show that, although complement-fixing antibodies are present in the blood of the tumor-immune rabbits, these bodies do not gain access to the aqueous humor. It is suggested that this absence of antibodies in the aqueous fluid is responsible for the successful growth of the tumor.

T. E. Sanders.

Cheever, F. S., and Morgan, H. R. **Mechanism of tumor immunity as investigated by means of the intraocular inoculation of the Brown-Pearce carcinoma.** Cancer Research, 1942, v. 2, Oct., p. 675.

Previous investigators had not agreed on whether there was any resistance to inoculation of tumor tissue into the anterior chamber of animals immunized to that tumor. In order to obtain additional evidence on the problem the authors undertook the present work. Implantation of fragments of the Brown-Pearce carcinoma into the anterior chamber of the eyes of normal animals immunized by any one of several standard methods was unsuccessful in 18 of 20 cases. Secondary intraocular inoculations after primary implantation of tumor material into the other eye were generally successful. Of 11 tumor fragments remaining as long as 14 days in the eyes of immune animals, only two proved viable and capable of proliferation when implanted into the eyes of normal animals. This evidence suggests the presence, in the aqueous humor of immune rabbit eyes, of an agent capable of destroying or rendering nonmalignant the cells of the Brown-Pearce carcinoma. (13 references.)

Ralph W. Danielson.

PAN-AMERICAN NOTES

Edited by Dr. M. Uribe Troncoso
500 West End Avenue, New York

Communications should reach the Editor by the twelfth of the month

Miscellaneous

The National Society for the Prevention of Blindness held its annual meeting for 1942 at the Hotel Roosevelt, New York City. The guest of honor of the meeting was Dr. Moacyr E. Alvaro, secretary general of the National Committee for the Prevention of Blindness in Brazil. At this meeting papers were contributed by Dr. Williams F. Snow, General Director of the American Social Hygiene Association, and by Dr. A. Driesbach, Assistant Director of the Office of the Coördinator of Inter-American affairs. The meeting was attended by delegates from Brazil, Mexico, and Paraguay.

On the following day the Society gave a dinner in honor of Dr. Alvaro, Dr. Conrad Berens, a member of the Board of Directors, presiding. After-dinner speakers who emphasized the work of Dr. Alvaro in the organization of the Pan-American Congresses of Ophthalmology and in the National Society for the Prevention of Blindness in Brazil were: Drs. Conrad Berens, M. U. Troncoso, Daniel Kirby, W. F. Snow, and Bernard Samuels.

Present at the dinner were the delegate from Mexico, Dr. Sanchez Burnes; Dr. Gonzalves, Ophthalmologist in Chief of the Brazilian Army, and others.

Premio Moura-Brazil. The Academia Nacional de Medicina of Brazil each year awards a prize to the best ophthalmological paper published in the country. The Moura-Brazil prize for 1942 was awarded to Prof. B. de Paula Santos for his thesis on "Trachomatous lesions of the cornea and their frequency. A contribution to the biomicroscopy of trachoma."

Journals

Arquivos Brasileiros de Oftalmologia. The August number of this journal, organ of the National League for the Prevention of Blindness in São Paulo, Brazil, contains the following articles: Hereditary ophthalmoplegia and myasthenia of the ophthalmoplegic type, by Drs. B. Courtis and R. Sitler; Conjunctivitis of trypanosomiasis, or Chagas's disease, by Dr. R. Beltrao; Optics and opticians, by Dr. P. Falcao; Sulfapyridine in acute catarrhal conjunctivitis, by Dr. E. Pischo.

Archivos de Oftalmologia de Buenos Aires. The July, 1942, number of this interesting journal contains the following articles: Ocular torticollis (a contribution), by Prof. R. Argañaraz; Keratoplasty: Castroviejo's technique, by Dr. J. Malbrán; Central artery and provoked pulsation. Its analysis with a movie film, by Dr. J. Lijo Pavia; Mobilization of an endo-ocular foreign body, by Drs. J. Hurtault and A. G. Queró; Strange evolution of a preretinal hemorrhage, by Drs. C. S. Damel and O. C. Traví.

Personals

The annual prize of the Sociedad Argentina de Oftalmologia for 1941 was awarded to Drs. Benjamin Ré and Manuel C. Blanco, authors of the best paper on ophthalmology presented to the Society during the year. The paper is entitled, "Primary mycotic conjunctivitis."

NEWS ITEMS

Edited by Dr. Ralph H. Miller
803 Carew Tower, Cincinnati

News items should reach the editor by the twelfth of the month

Deaths

Dr. Robert E. Hilburn, Wichita Falls, Texas, died September 6, 1942, aged 60 years.

Dr. Lewis L. Bartlett, Dalhart, Texas, died September 24, 1942, aged 81 years.

Dr. Henry S. Schuhmann, New York, New York, died October 15, 1942, aged 66 years.

Dr. Julius F. Mauermann, Monroe, Wisconsin, died October 23, 1942, aged 70 years.

Dr. Edward E. Woodside, Marion, Illinois, died October 24, 1942, aged 66 years.

Dr. James R. Mossgrove, Steubenville, Ohio, died October 28, 1942, aged 67 years.

Dr. James R. Strong, Leadville, Colorado, died October 14, 1942, aged 64 years.

Dr. Lucius B. Leake, Temple, Texas, died recently, aged 45 years.

Dr. Clyde A. Noland, Long Beach, Califor-

nia, died October 24, 1942, aged 67 years.

Dr. Charles R. Tanner, Henderson, Kentucky, died November 2, 1942, aged 65 years.

Dr. William T. Shoemaker, Philadelphia, Pennsylvania, died November 26, 1942, aged 73 years.

Dr. Samuel Hanford McKee, Montreal, Quebec, Canada, died November 25, 1942, aged 67 years. [See Obituaries.]

Dr. Samuel S. Barrett, Nevada, Ohio, died November 5, 1942, aged 80 years.

Dr. Ephraim E. Ellsworth, Ironton, Ohio, died November 12, 1942, aged 78 years.

Dr. William G. Moorehouse, Lancaster, Pennsylvania, died November 2, 1942, aged 80 years.

Dr. Edwin S. Saylor, West Point Pleasant, New Jersey, died November 23, 1942, aged 76 years.

Miscellaneous

The Gill Memorial Eye, Ear, and Throat Hospital of Roanoke, Virginia, announces its seventeenth annual Spring Graduate Course in ophthalmology, otology, rhinology, laryngology, faciomaxillary surgery, bronchoscopy, and esophagoscopy, on April 5 to 10, 1943. In ophthalmology, clinics will be conducted by the following ophthalmologists: Drs. Bruce Fralick, Peter C. Kronfeld, George P. Guibor, John M. McLean, Robert J. Masters, A. L. Brown, Ramón Castroviejo, and Willis S. Knighton.

The National Society for the Prevention of Blindness has announced that Dr. Mark J. Schoenberg, chairman of its Glaucoma Committee, is now in charge of the station for checking the accuracy of original Schiötz tonometers which is maintained at the headquarters of the Society, 1790 Broadway, New York City. Dr. Adolph Posner, who formerly directed the tonometer-checking station, is now on active duty with the United States Army Medical Corps.

The University of Virginia Department of Medicine, Charlottesville, Virginia, held its ninth annual postgraduate course in ophthalmology and otolaryngology, December 8th to 11th. Among the participants were: Drs. Francis H. Adler, Philadelphia; Grady E. Clay, Atlanta; Raymond L. Pfeiffer, New York; and Edmund B. Spaeth, Philadelphia.

The fifth annual Forum on Allergy was held at the Hotel Statler, Cleveland, on January 9th and 10th. Dr. J. Warrick Thomas addressed a study group on "Allergy of the eye and conjunctiva."

Societies

The Washington, D.C., Ophthalmological Society held its regular meeting on January 11th at the Episcopal Eye, Ear, and Throat Hospital. The guest speakers were Dr. Bernard Samuels, New York City, who lectured on "Macular disease," and Dr. Edgar Burchell, New York City, who spoke on "Paranasal sinuses in relation to the orbit." A case report, "Foreign body of the orbit—self extruded," was presented by Dr. Joseph Urban. Cases were presented by Drs. Ronald Cox and Frank Costenbader, on "Bilateral choked disc —etiology undetermined," and "Duane's syndrome," respectively. Drs. William Thornwall Davis and Ernest Sheppard also presented a case, "Luxation of the lacrimal glands."

Personals

The Spanish-American Medical Society of New York gave a dinner on November 14th, in the Waldorf Astoria Hotel, New York, in honor of Dr. M. U. Troncoso for the Research Medal conferred on him last June by the Section of Ophthalmology of the American Medical Association. Presiding at the dinner was Dr. Rafael E. Lopez, President of the Society, who acted as toastmaster. Addresses were given by Dr. Max A. Ramirez, President of New York County Medical Society; Dr. Conrad Berens, President of the Section of Ophthalmology A.M.A.; His Excellency, Dr. Castillo Nájera, Ambassador from Mexico; Dr. R. Varela, and finally by Dr. M. U. Troncoso, who thanked the Society and the speakers for their words of praise. Drs. R. Castroviejo and Chevalier Jackson showed colored films of a trip to Mexico and of the city itself. The dinner was attended by a large and enthusiastic audience.

The staff and students at the University of Texas Medical Branch were recently addressed by Dr. Meyer Wiener, Coronado, California, on "War injuries to the eye."

Dr. William W. Reed, Topeka, was appointed state supervising ophthalmologist to the Kansas State Board of Social Welfare, succeeding Dr. Hazen L. Kirkpatrick, who recently resigned to enter the armed forces.

At the midwinter scientific session of the Central States Society of Industrial Medicine and Surgery, Dr. Hedwig S. Kuhn, Hammond, Indiana, spoke on "Visual testing in industry."

On January 7th Dr. Charles F. Kutscher was guest speaker at the third of a series of lectures given by the University of Pittsburgh School of Medicine and the Allegheny County Medical Society. The title of his address was "Eye injuries, diagnosis and treatment."